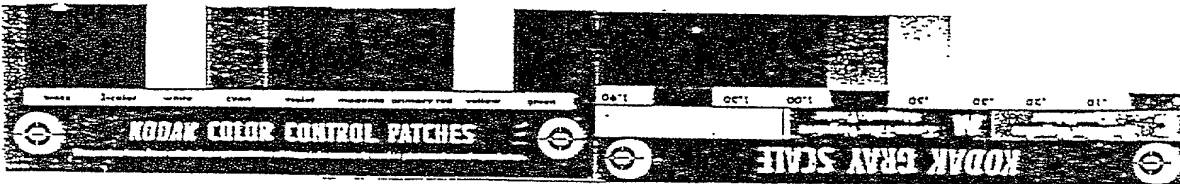


Fig. 1

Color comparison of various passive layers



Substrate: Zinc-plated screws

Blue chromation:	Left picture half
Invention:	Center
Yellow chromation:	Right picture half

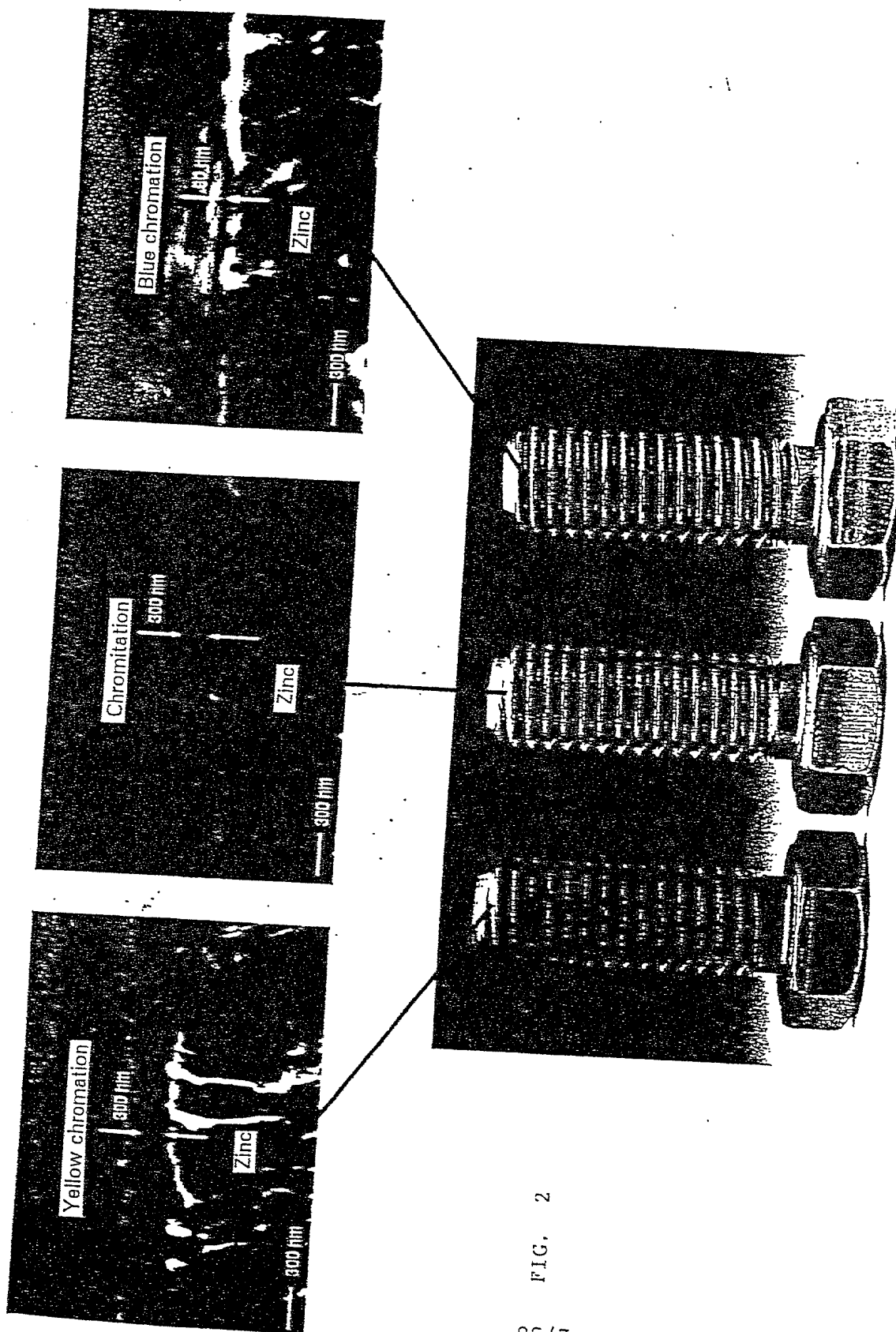


FIG. 2

Fig. 3

Bandwidth of iridescence according to the present invention
(on zinc-plated screws)

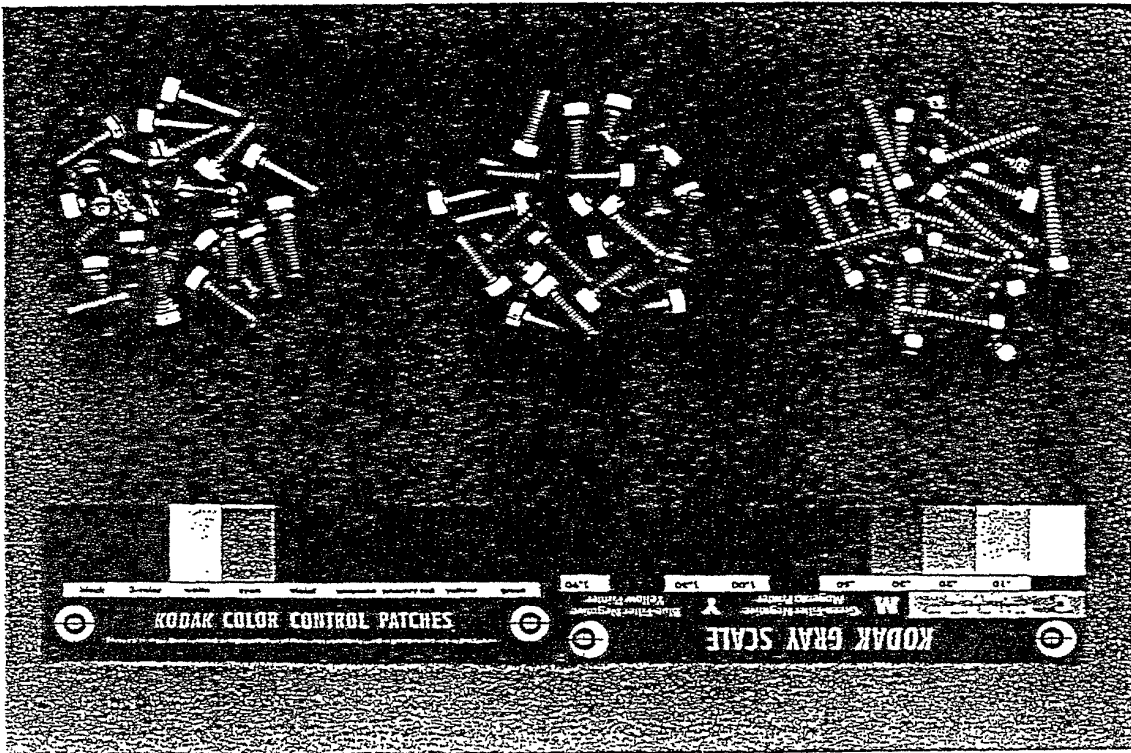
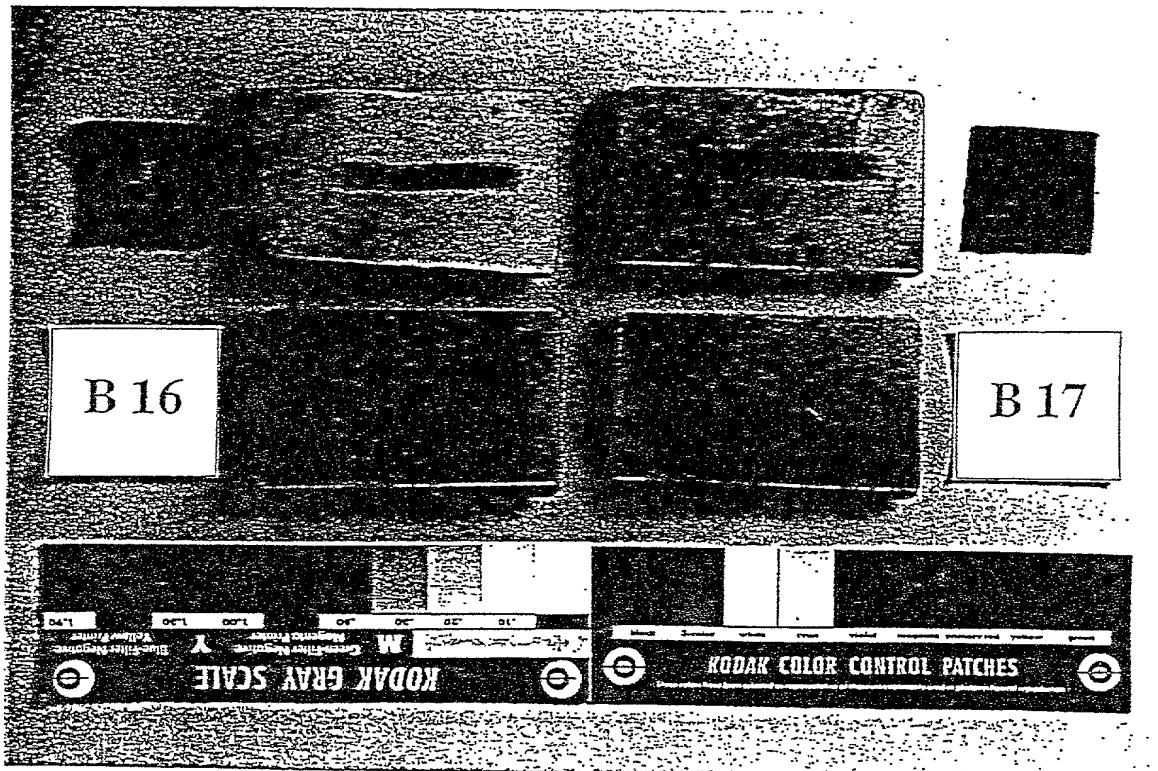


Fig. 4

Comparison test with EP 0 034 040

Example 16

Example 17



The upper picture half, one the outer left and right, shows a black cloth whereby the abrasions on the metal sheets shown in the top picture half were obtained. Layer portions - discernible as whitish stains - are on both pieces of cloth. The lower picture half shows the unmarred layers of the prior art.

Substrate: Zinc-plated steel sheet.

Diagram 1

Pattern 1, Measurement Position A

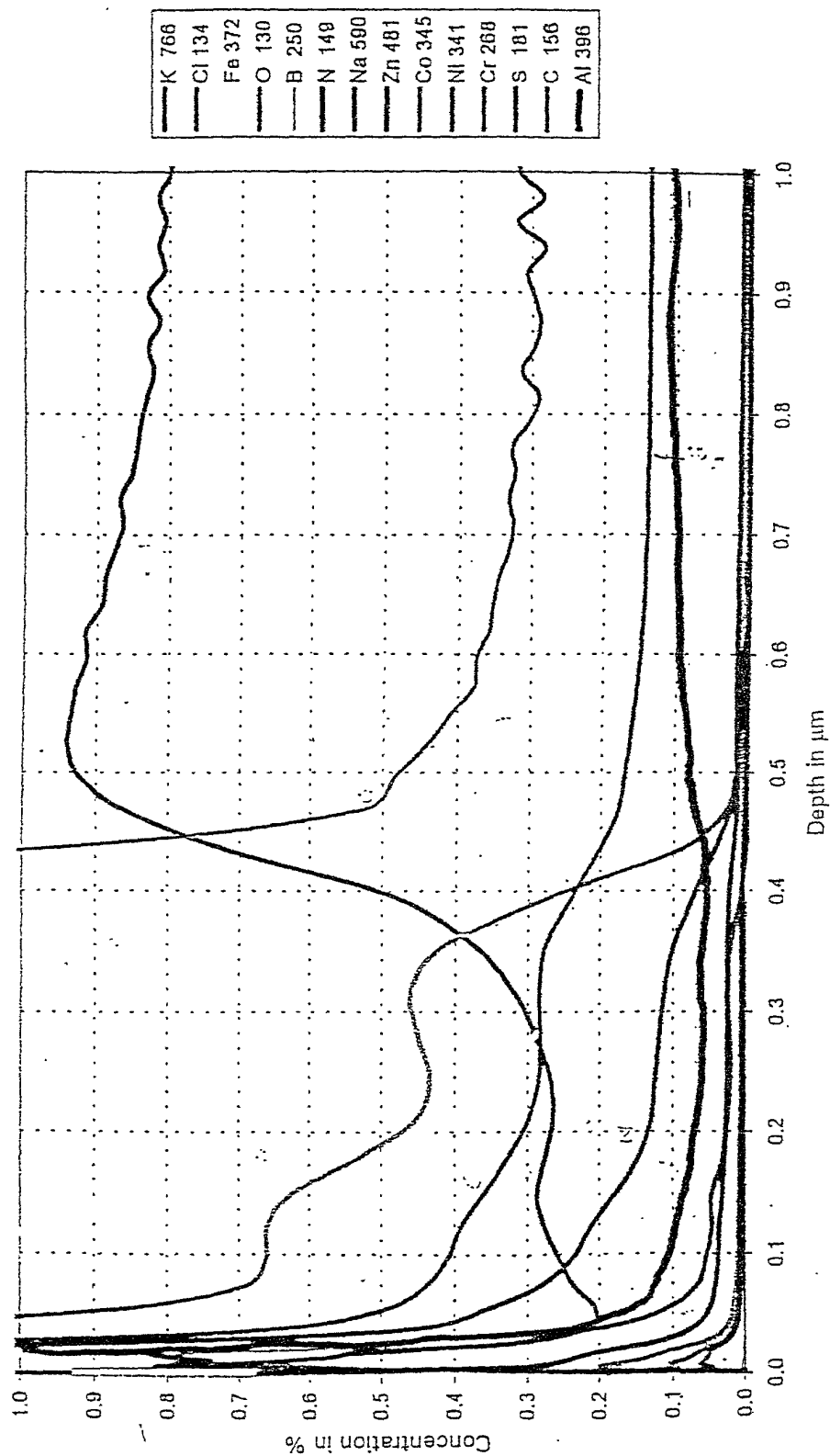


Diagram 2

Pattern 1, Measurement Position A

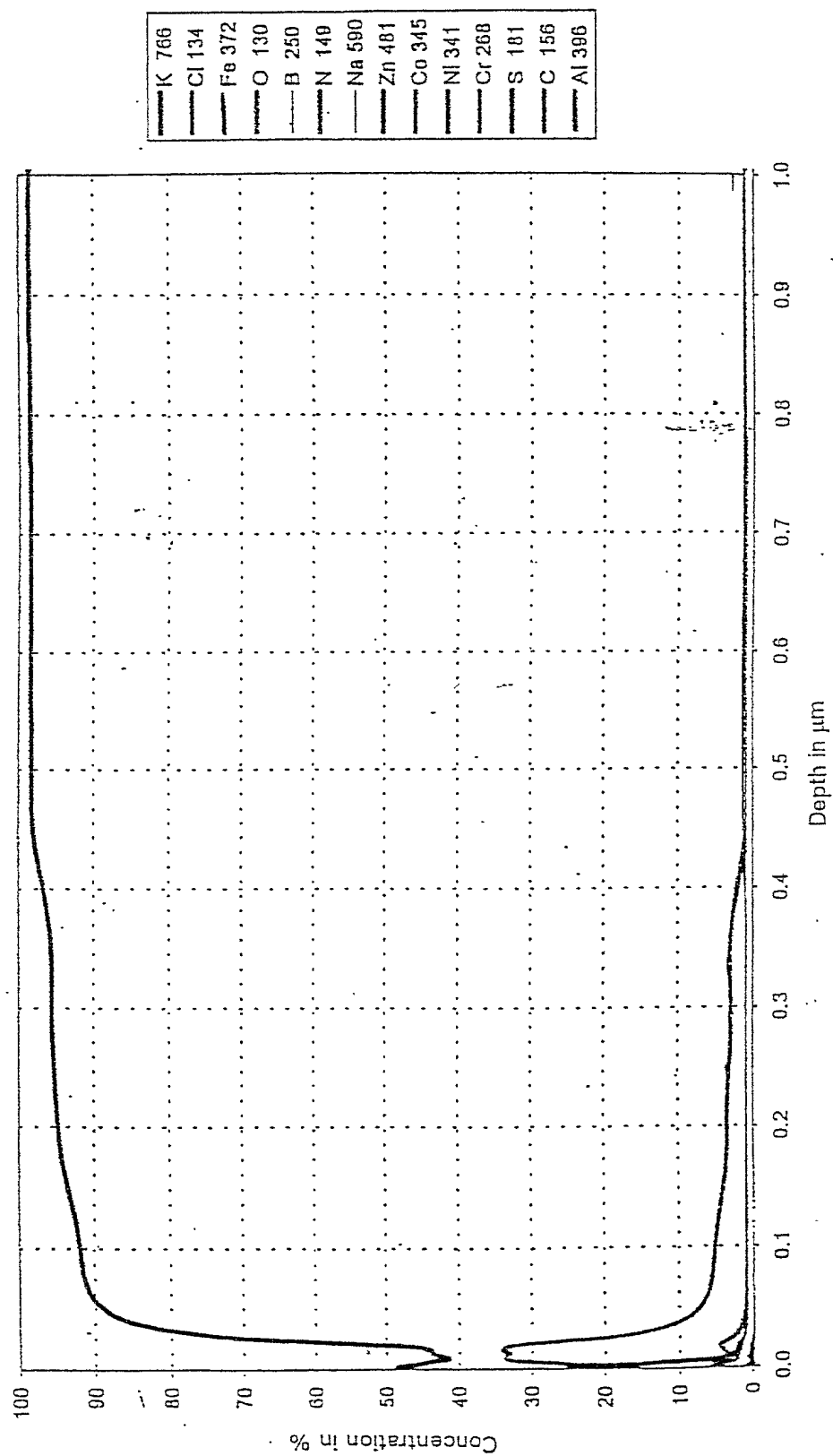


FIG. 6

Sample 1, Measurement Position B

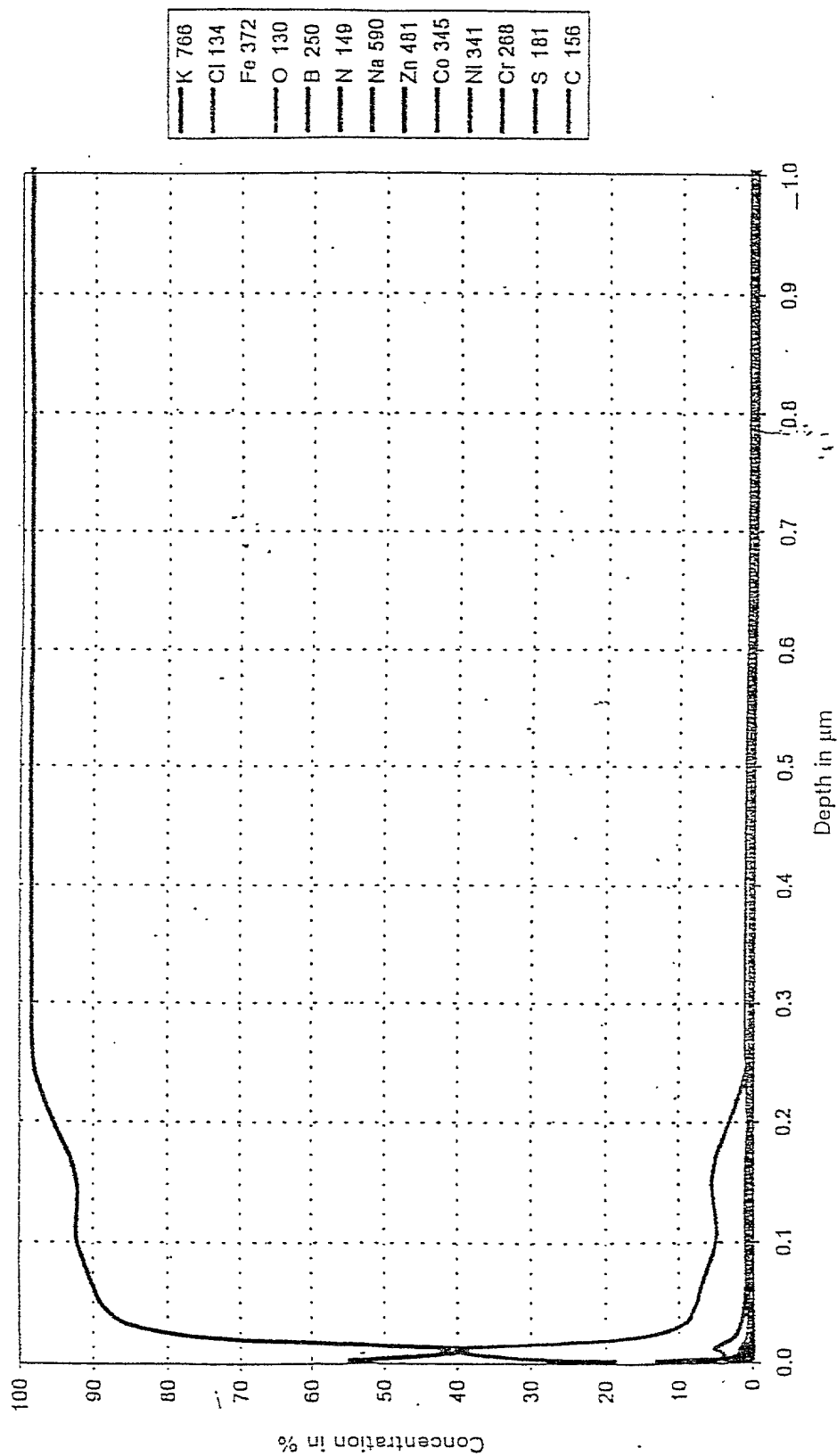


Diagram 2
Sample 1, Measurement Position B

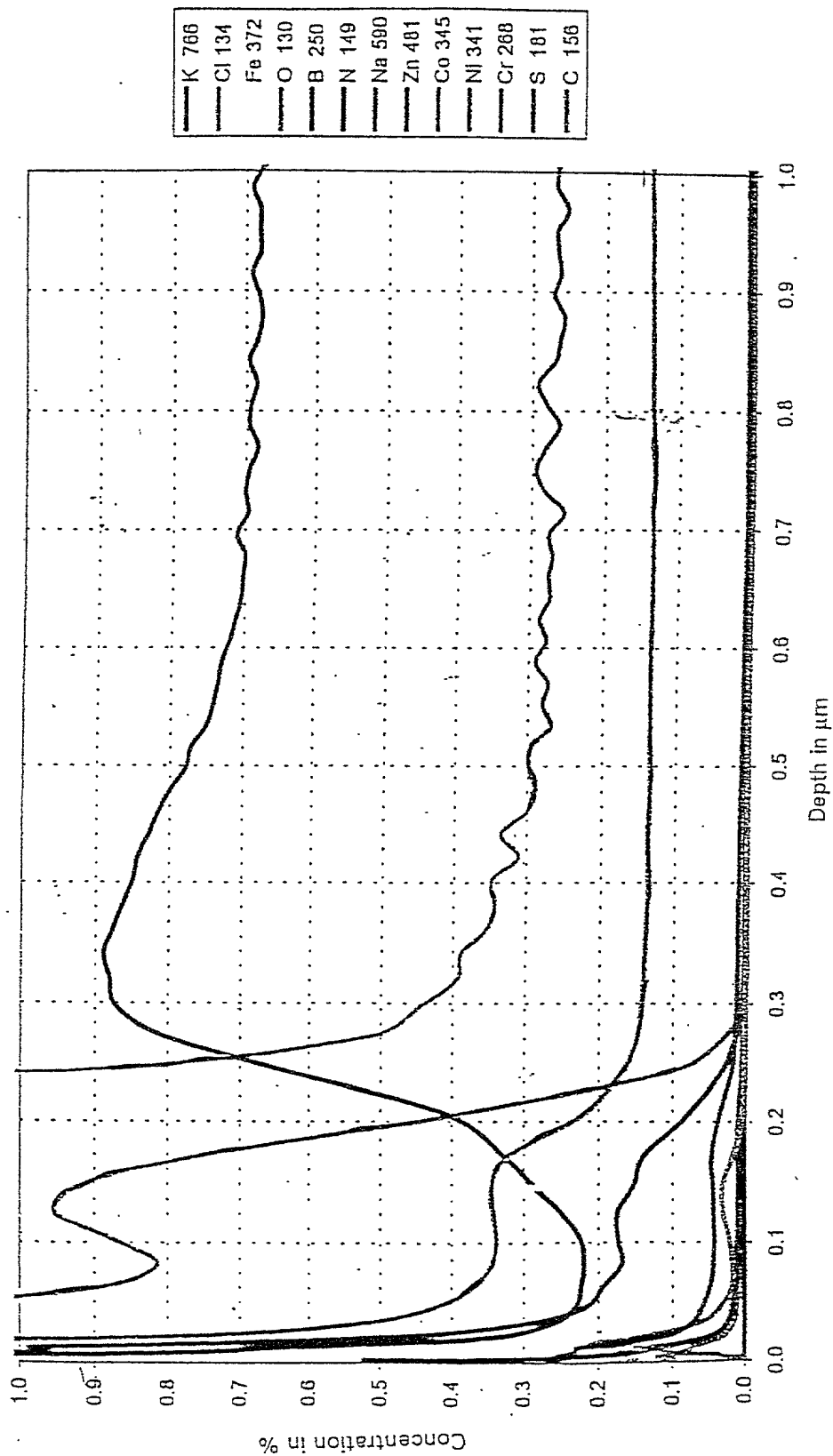


FIG. 8

Diagram 1

Sample 2, Measurement Position A

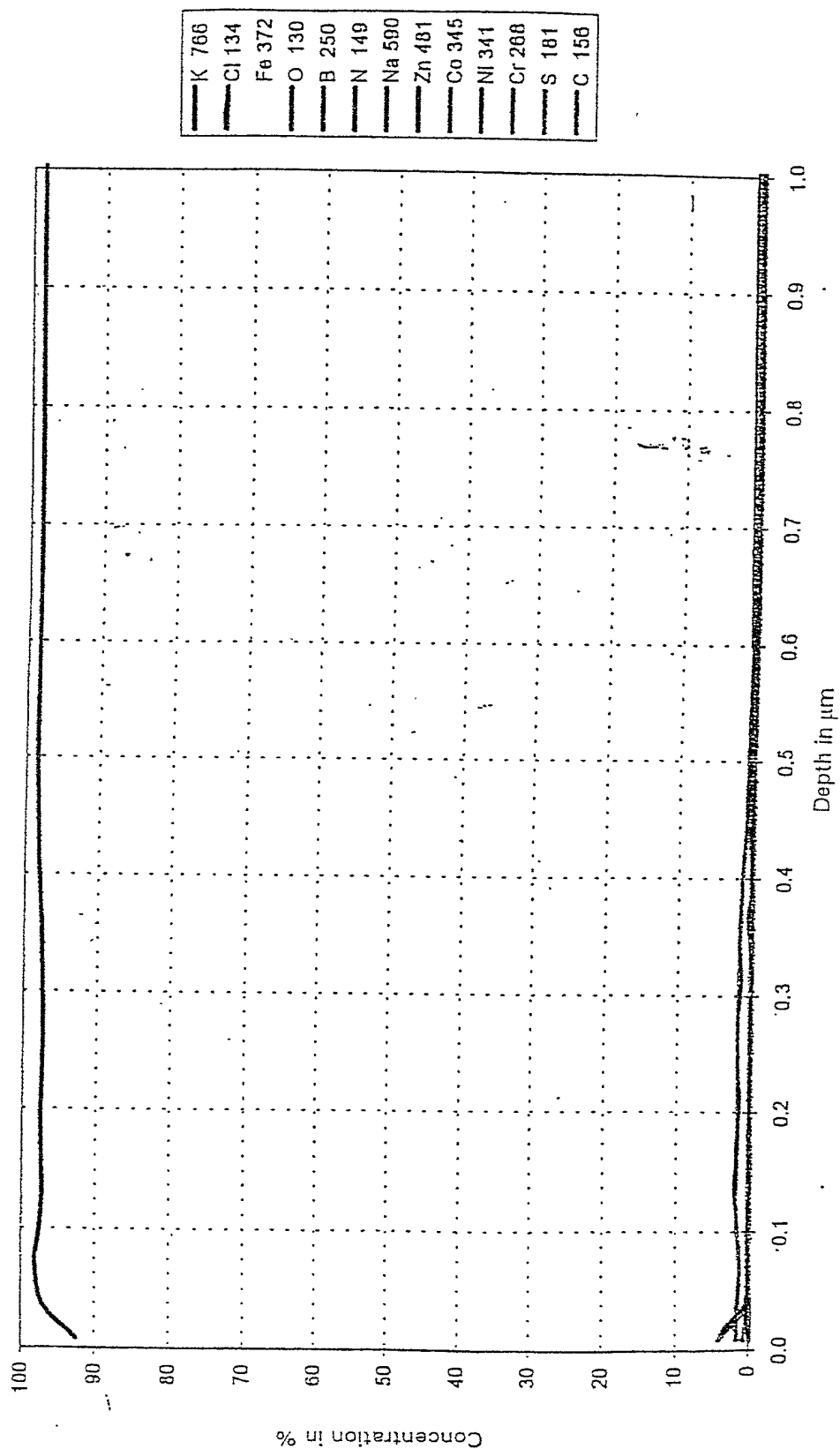


Diagram 2
Sample 2, Measurement Position A

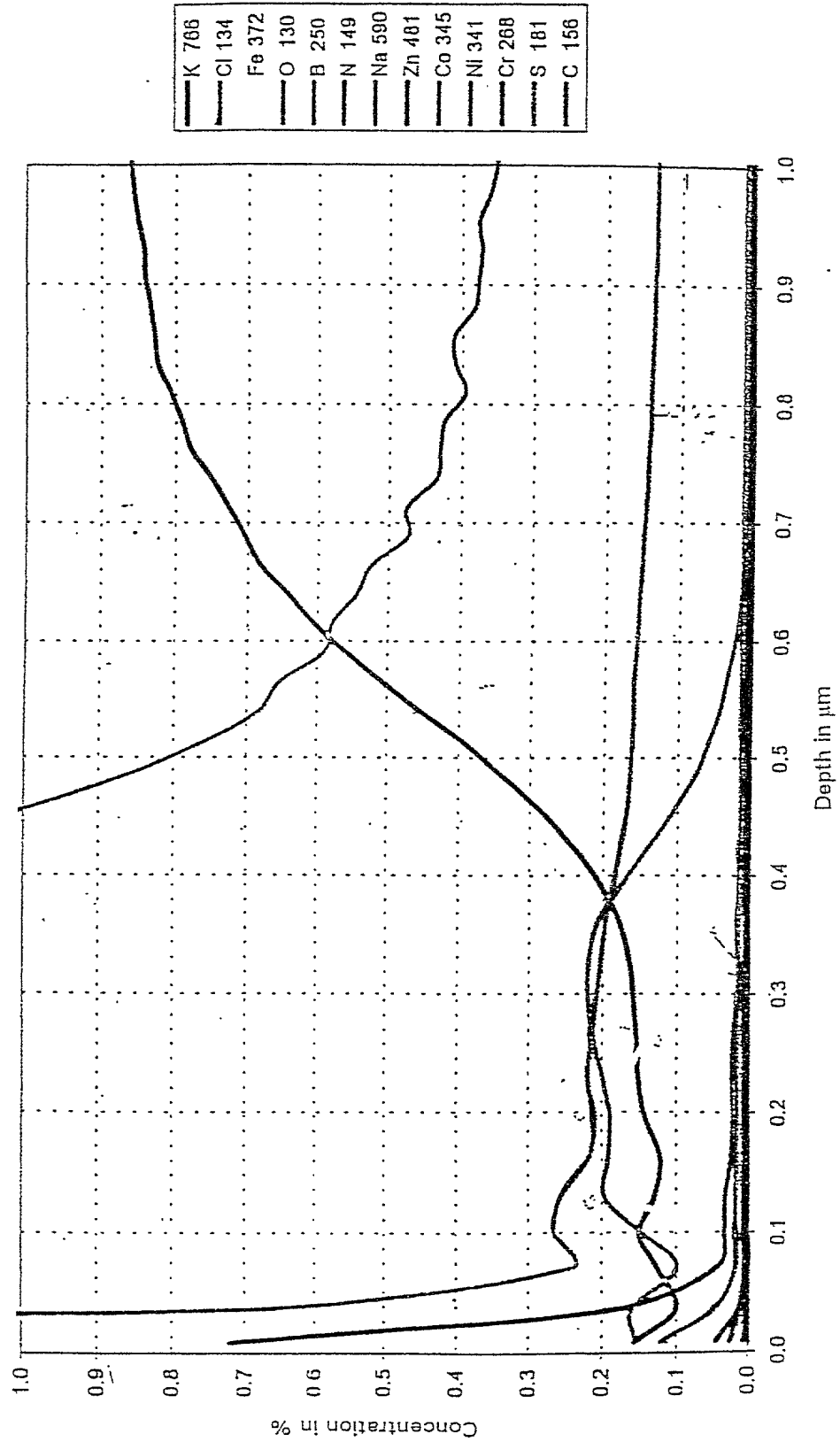


FIG. 10

—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

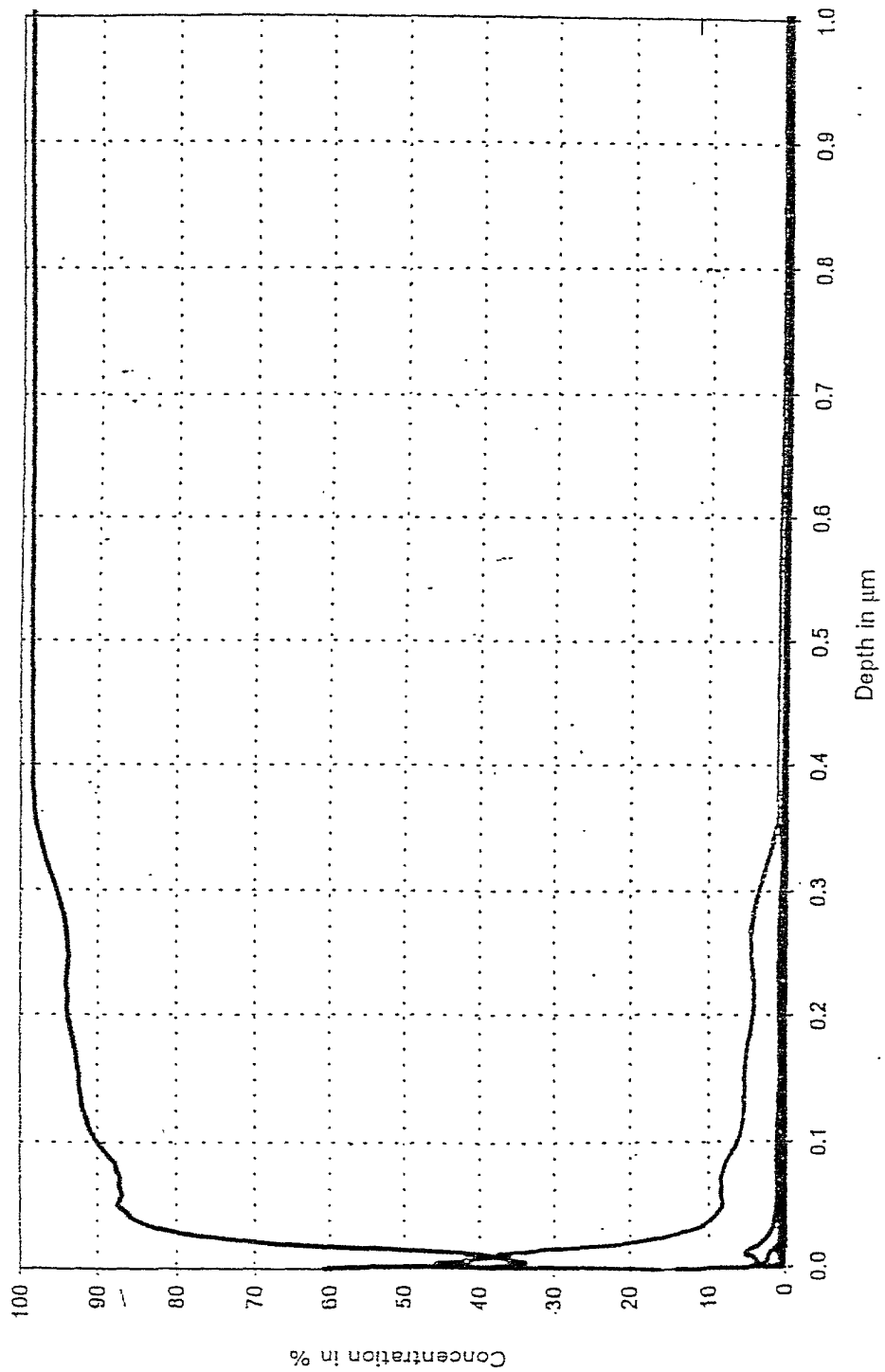


Diagram 1

Sample 2, Measurement Position B

Diagram 2
Sample 2, Measurement Position B

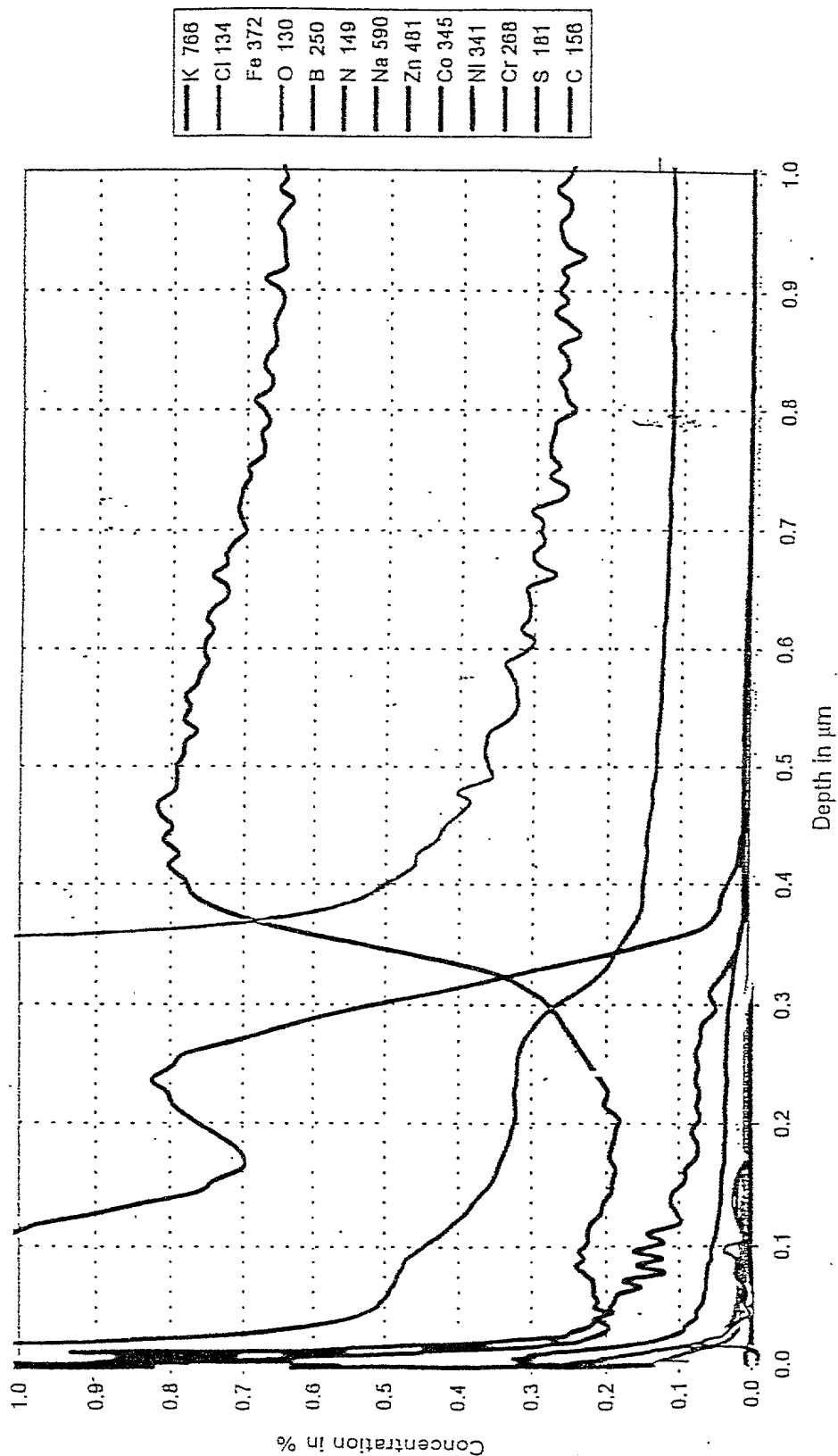


FIG. 12

Diagram 1
Sample 3, Measurement Position A

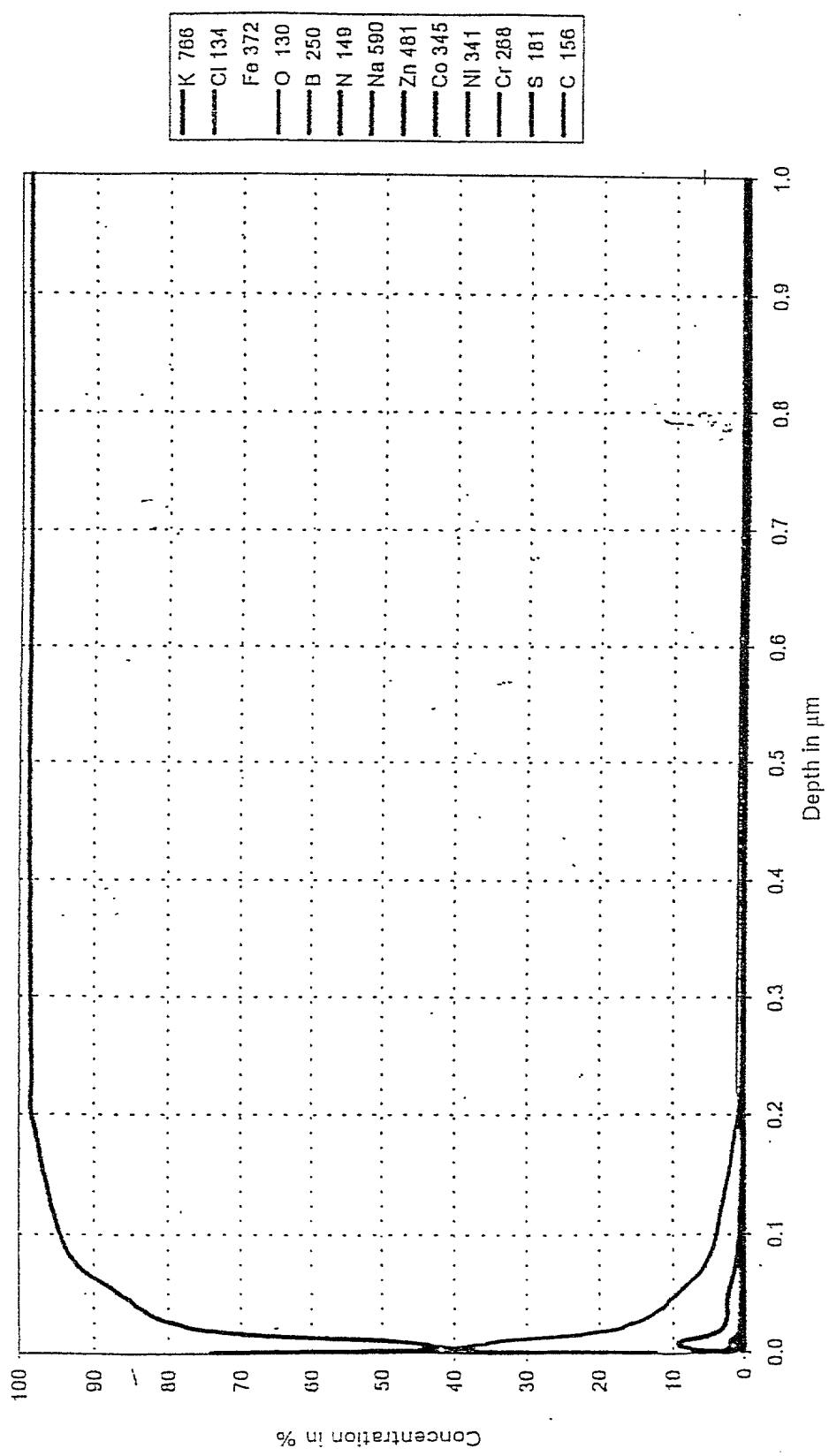


FIG. 14

Diagram 2

Sample 3, Measurement Position A

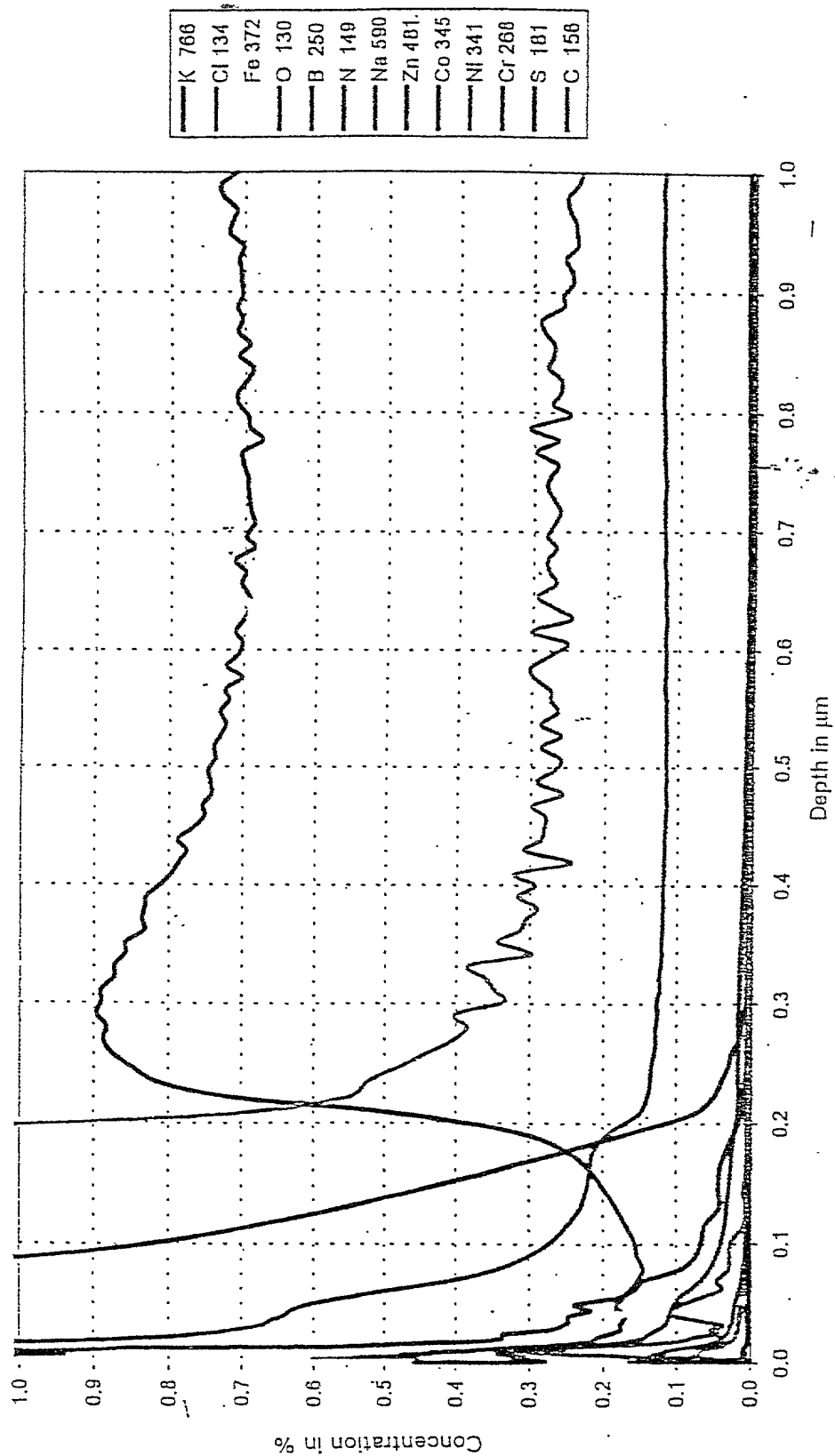


FIG. 15

Diagram 1

Sample 4, Measurement Position A

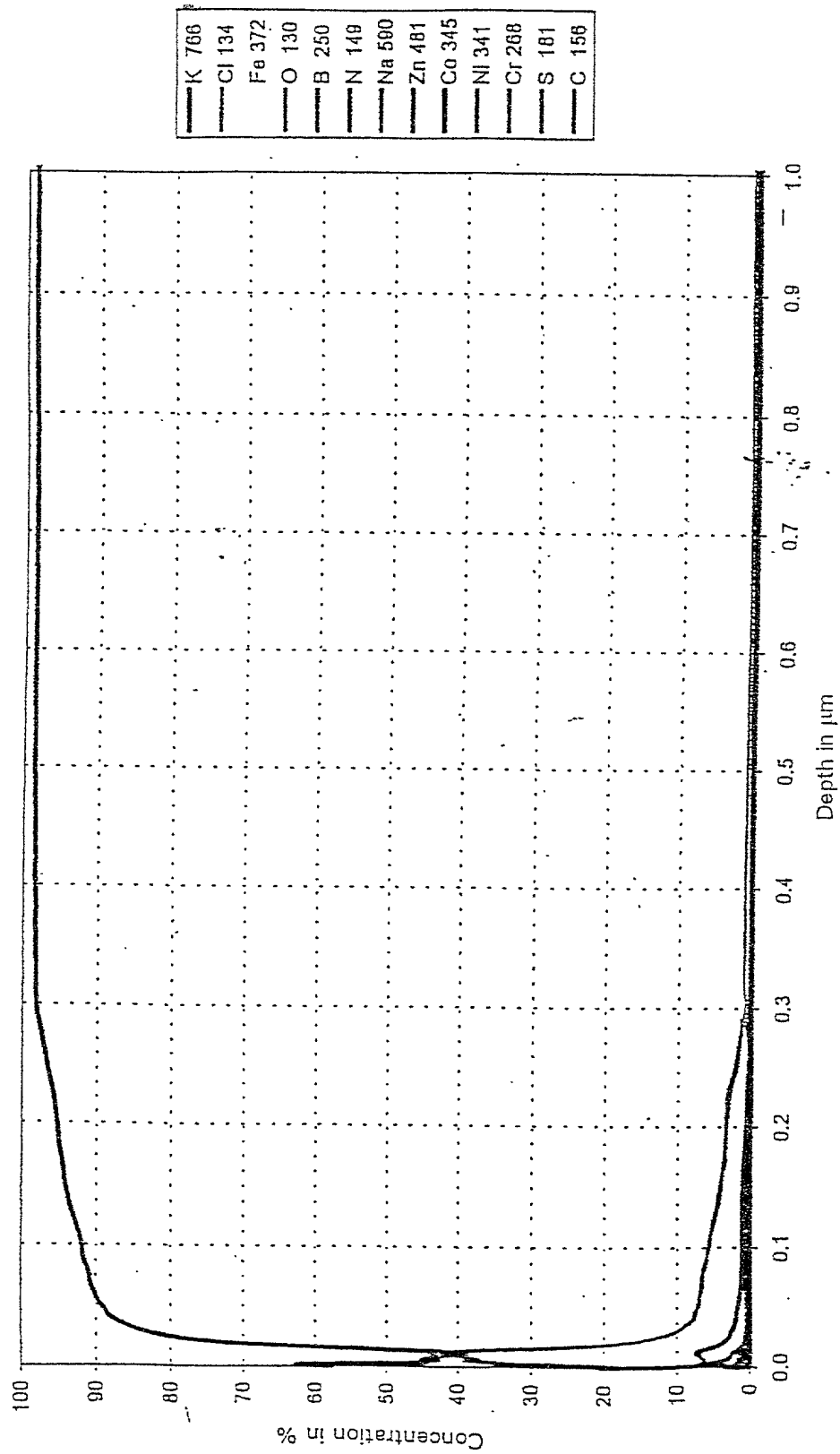


Diagram 2

Sample 4, Measurement Position A

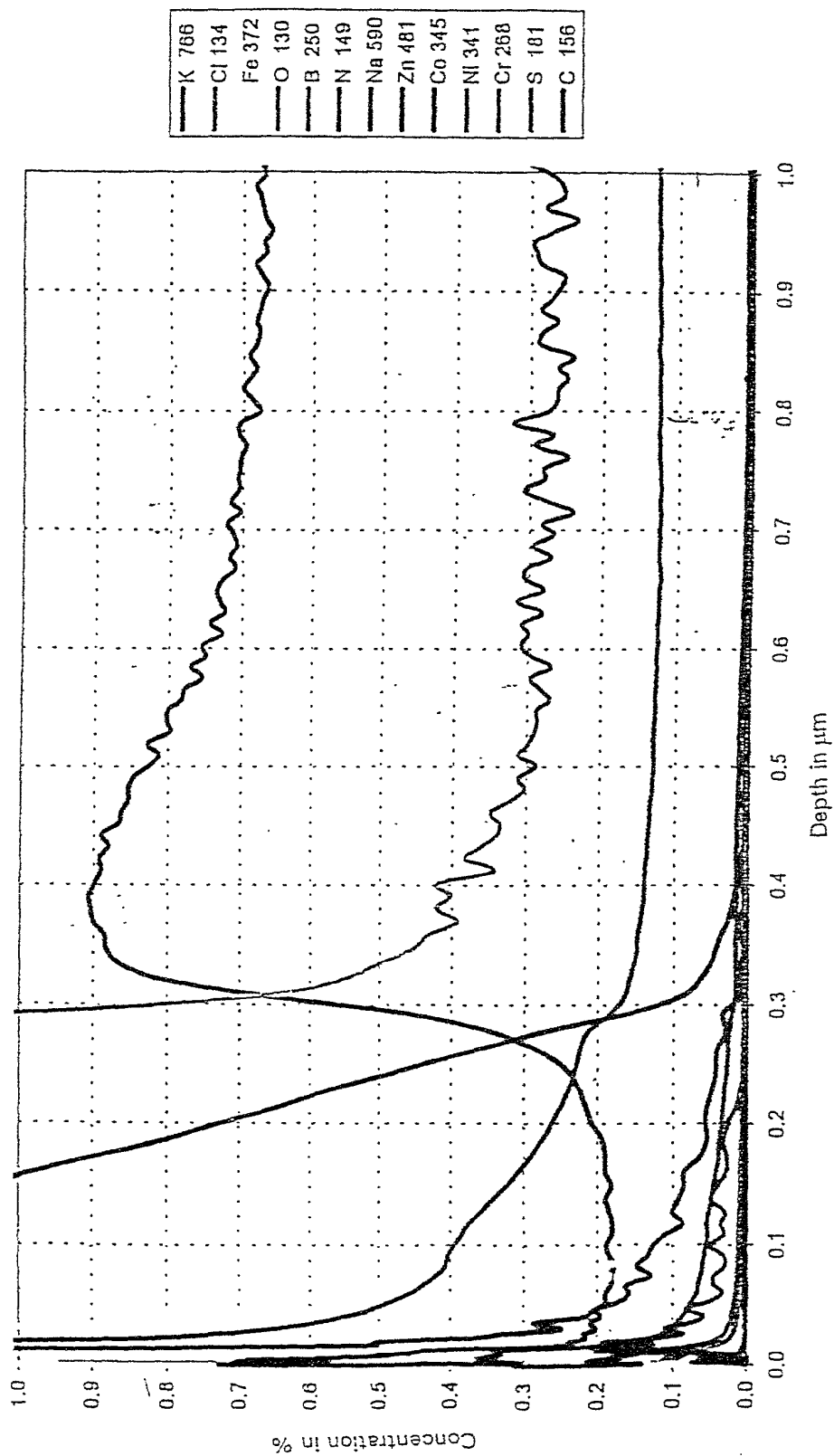


Diagram 1
Sample 5, Measurement Position A

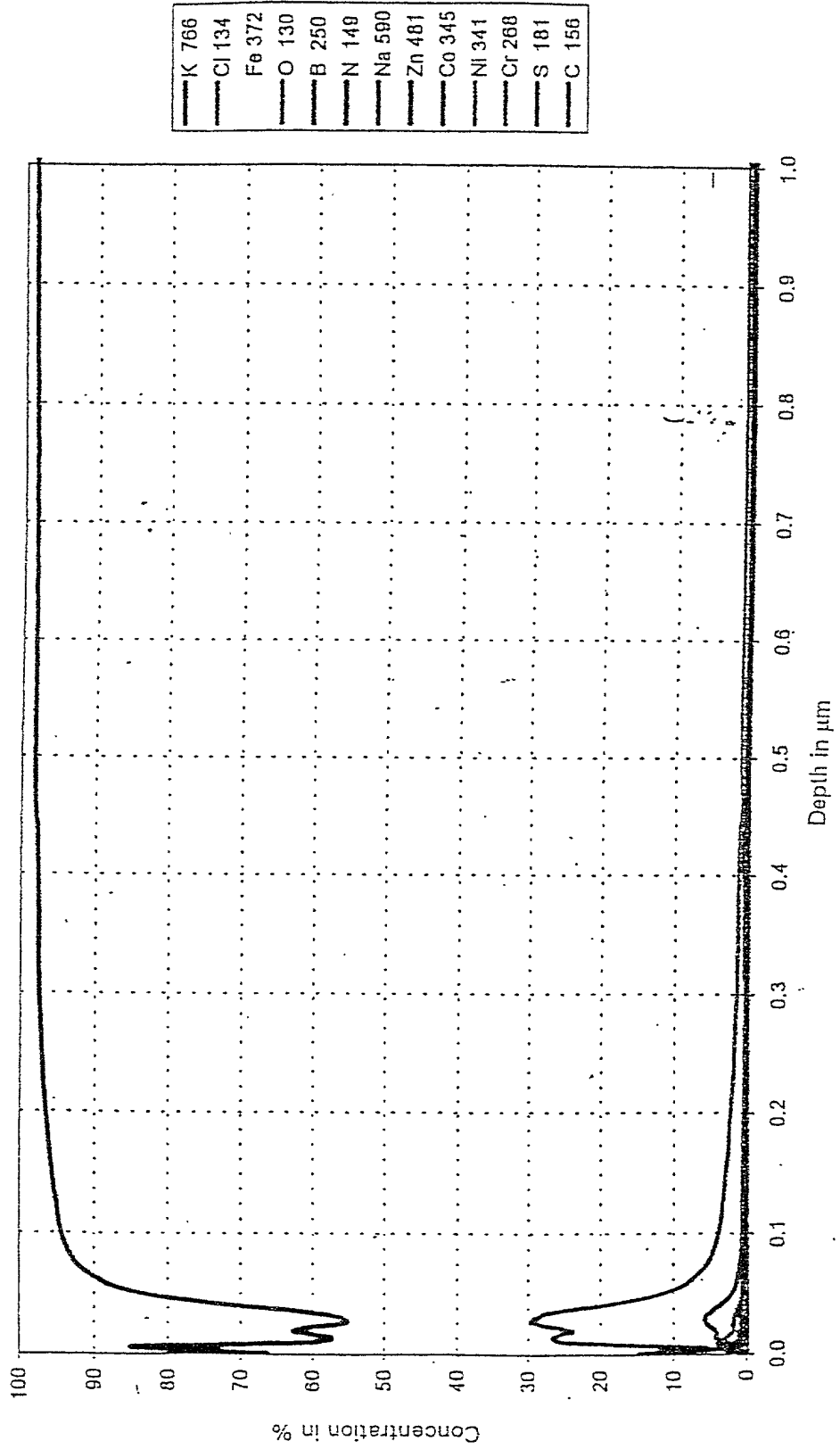
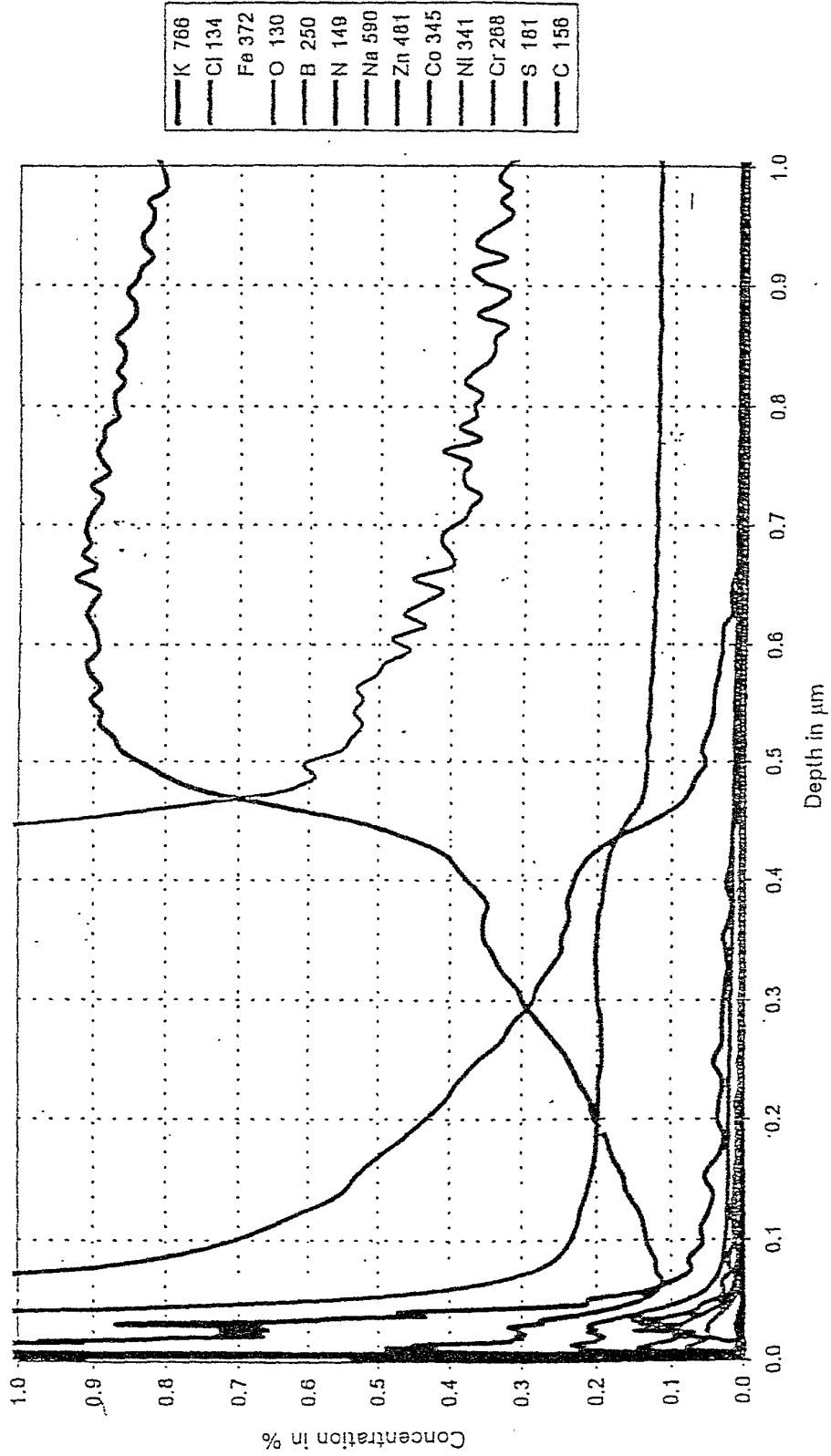


FIG. 17

Diagram 2

Sample 5, Measurement Position A

FIG. 18



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 288
—	S 181
—	C 156

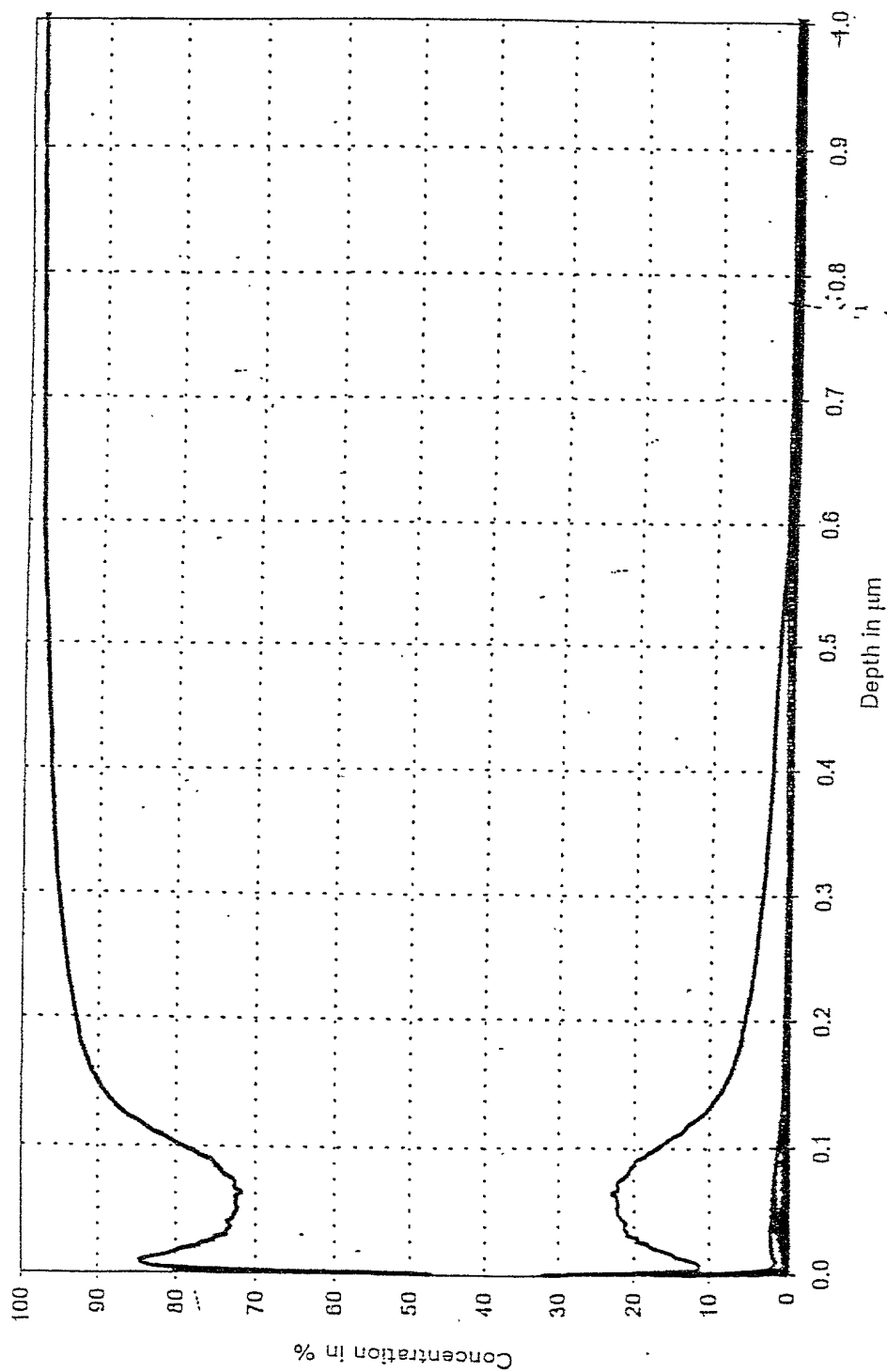


FIG. 19

Diagram 1

Sample 6, Measurement Position A

FOOT 66666666

Diagram 1

Sample 6, Measurement Position A

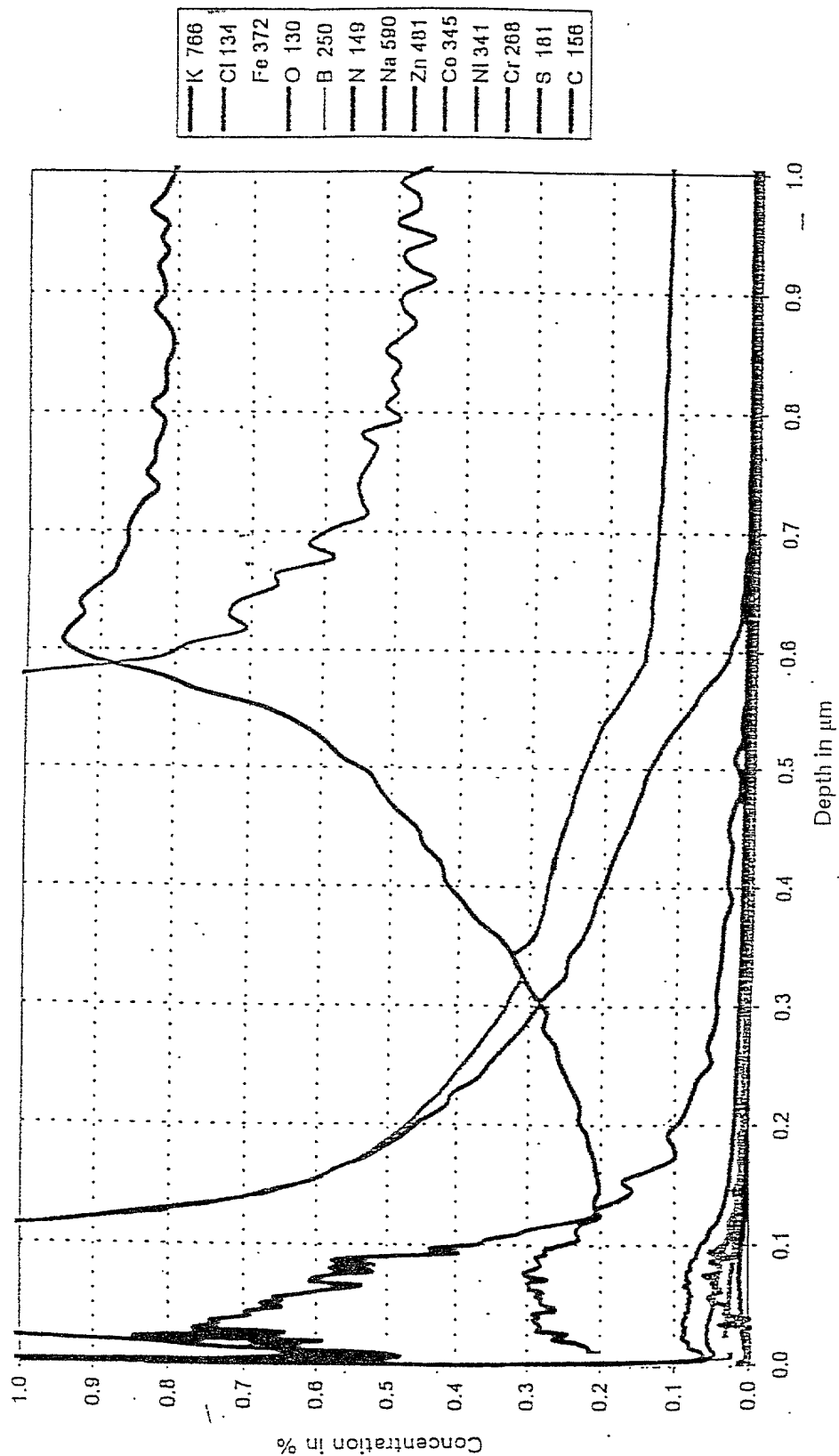


Diagram 1

Sample 6, Measurement Position B

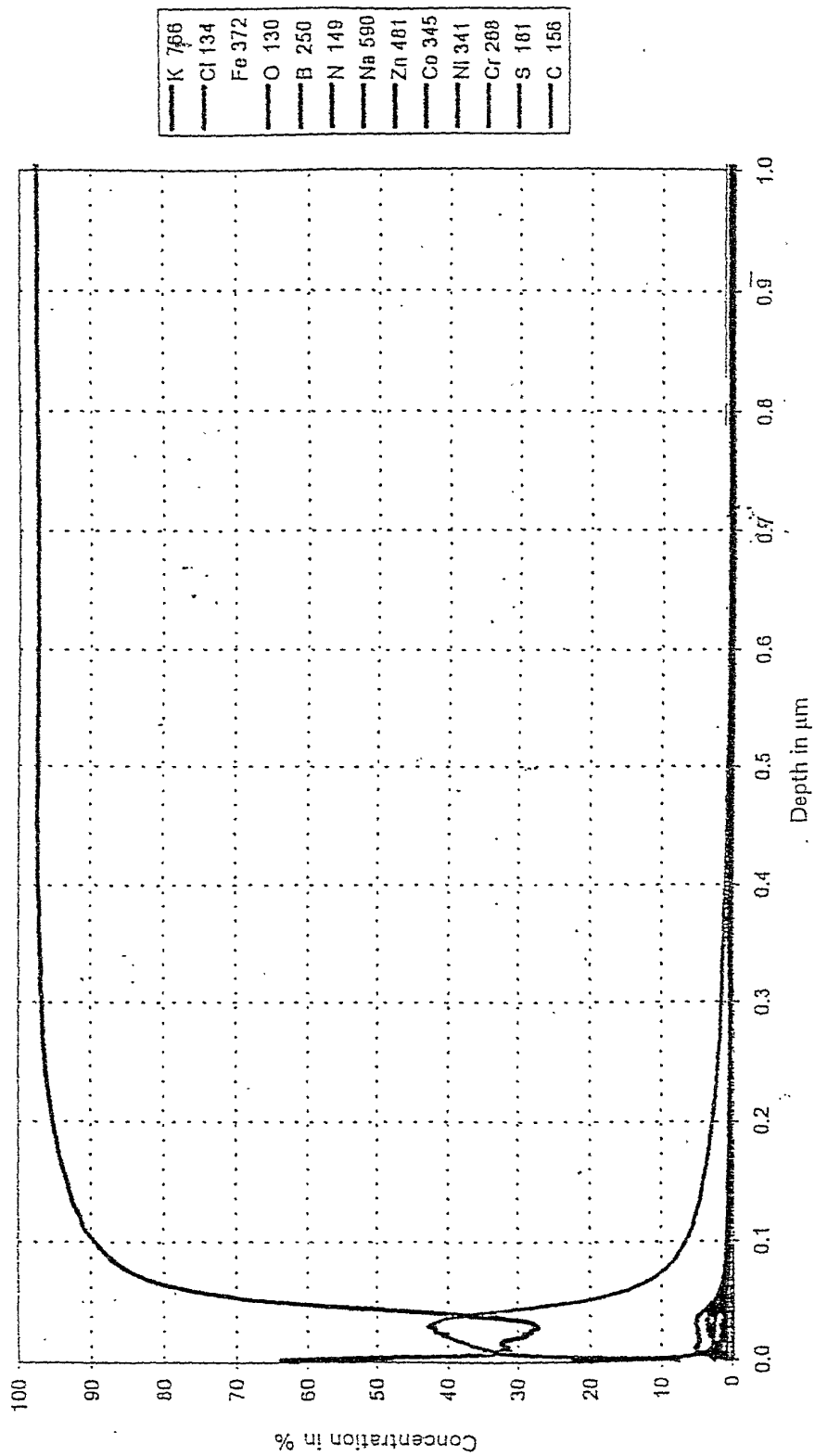


Diagram 2

Sample 6, Measurement Position B

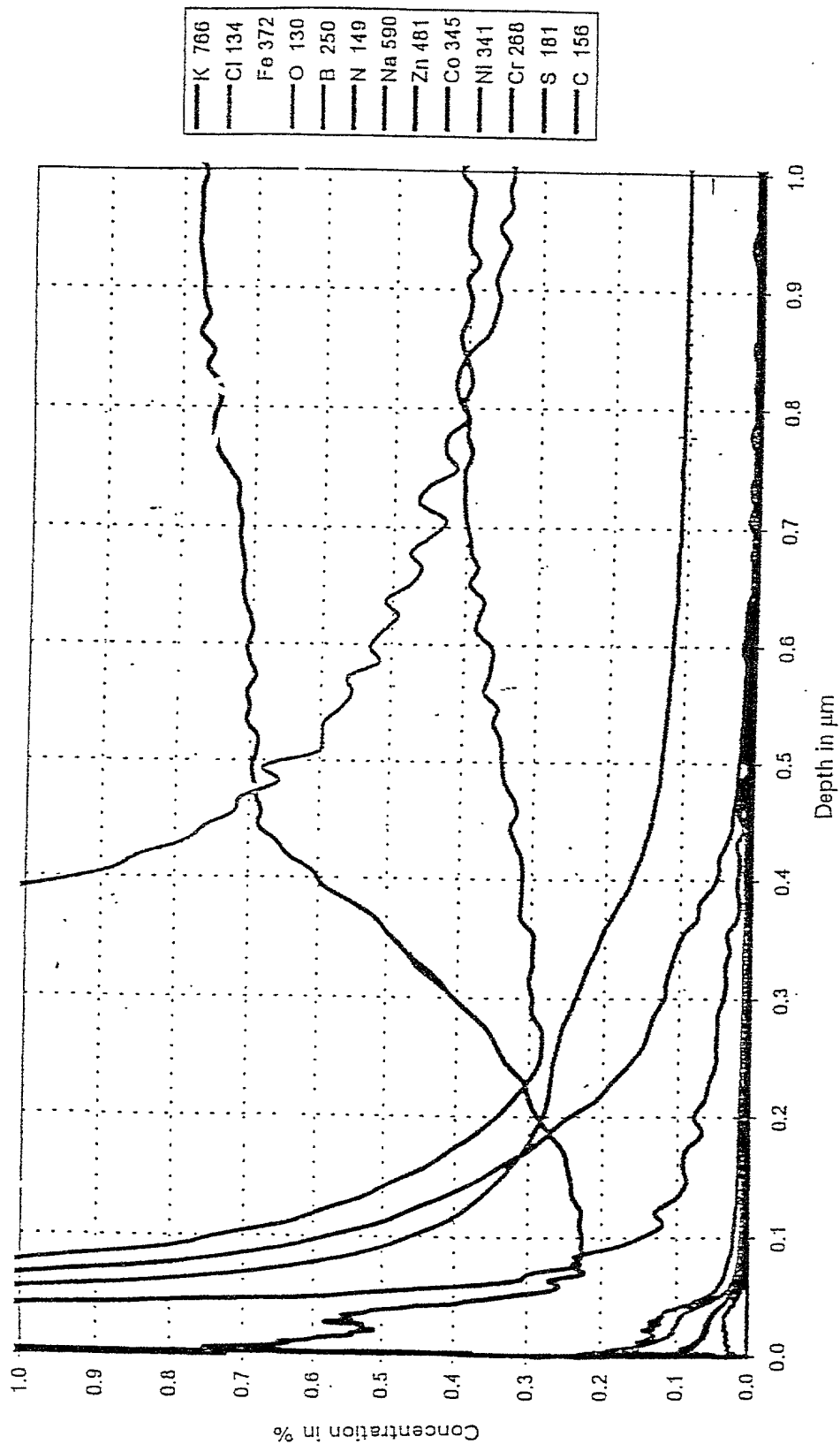


FIG. 22

Diagram 1

Sample 6, Measurement Position C

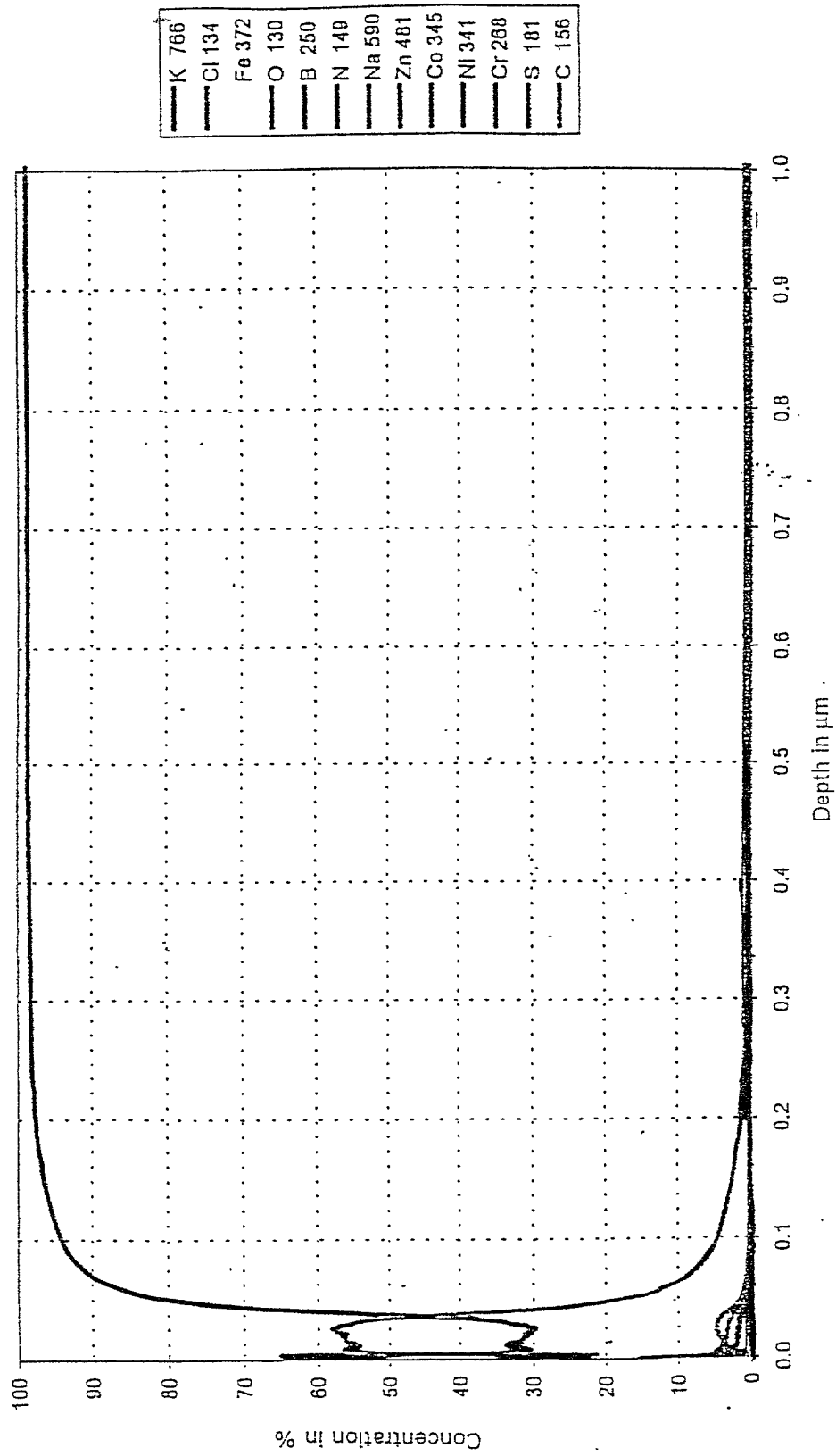


FIG. 23

Diagram 2

Sample 6, Measurement Position C

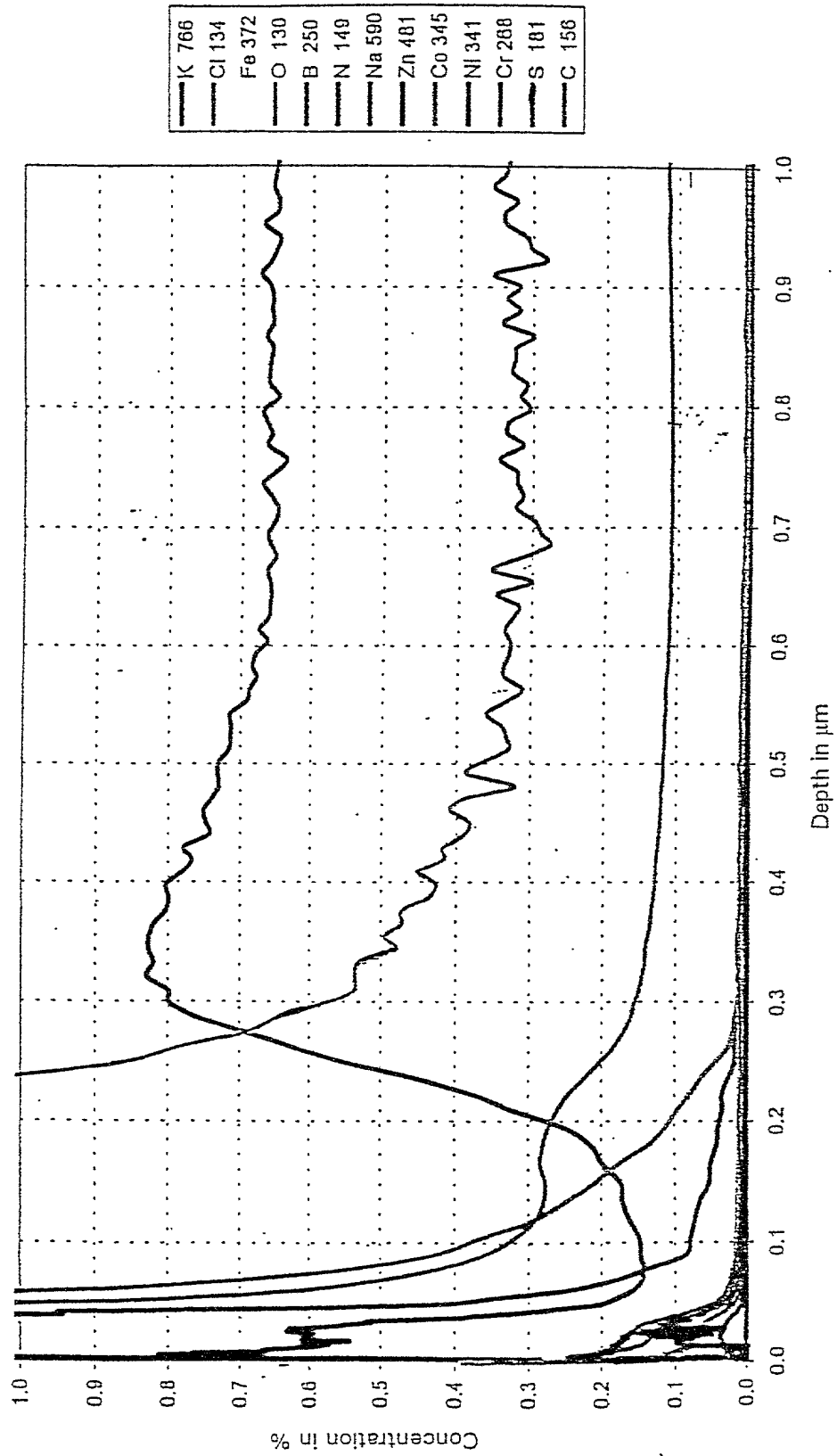
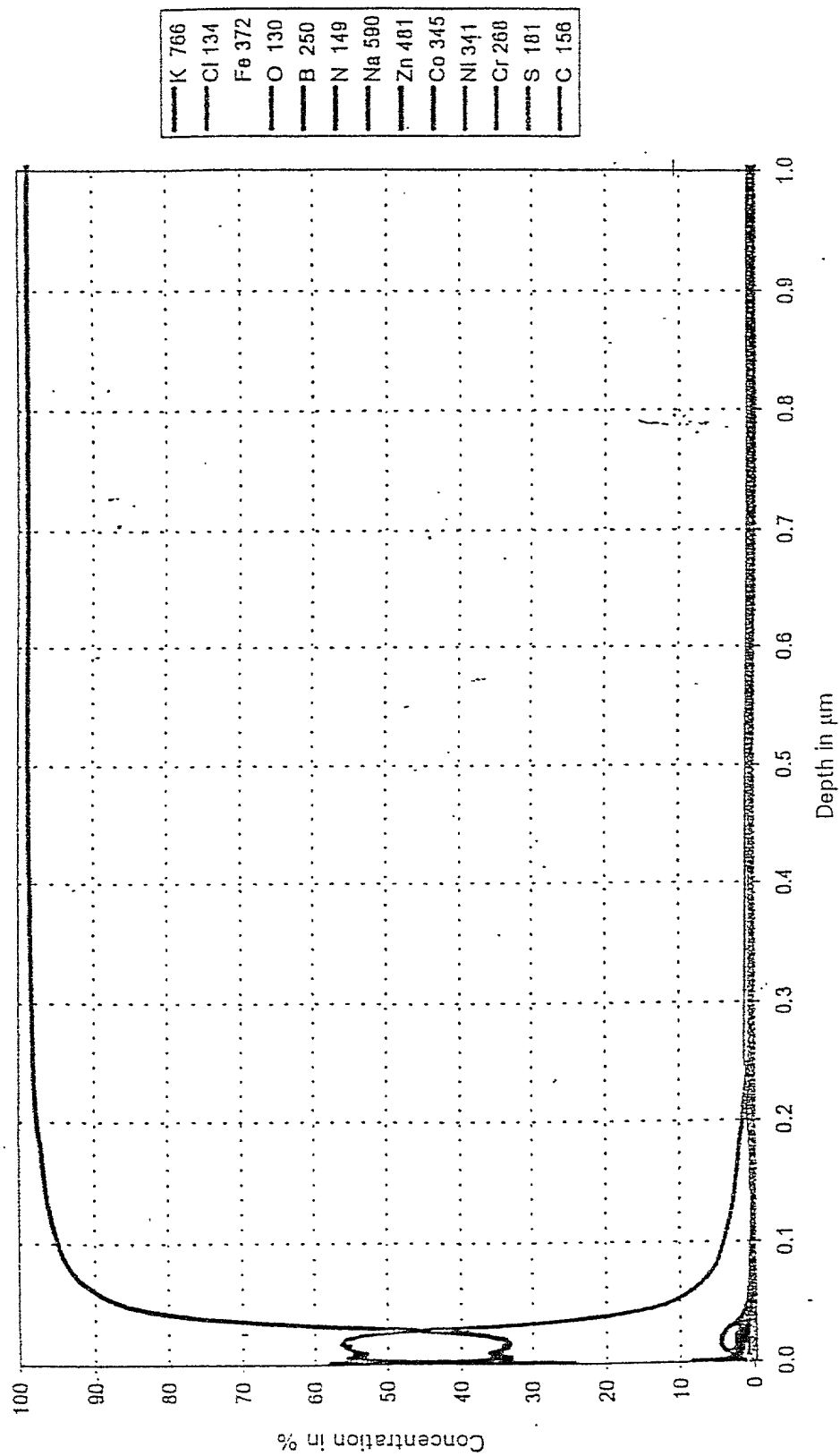


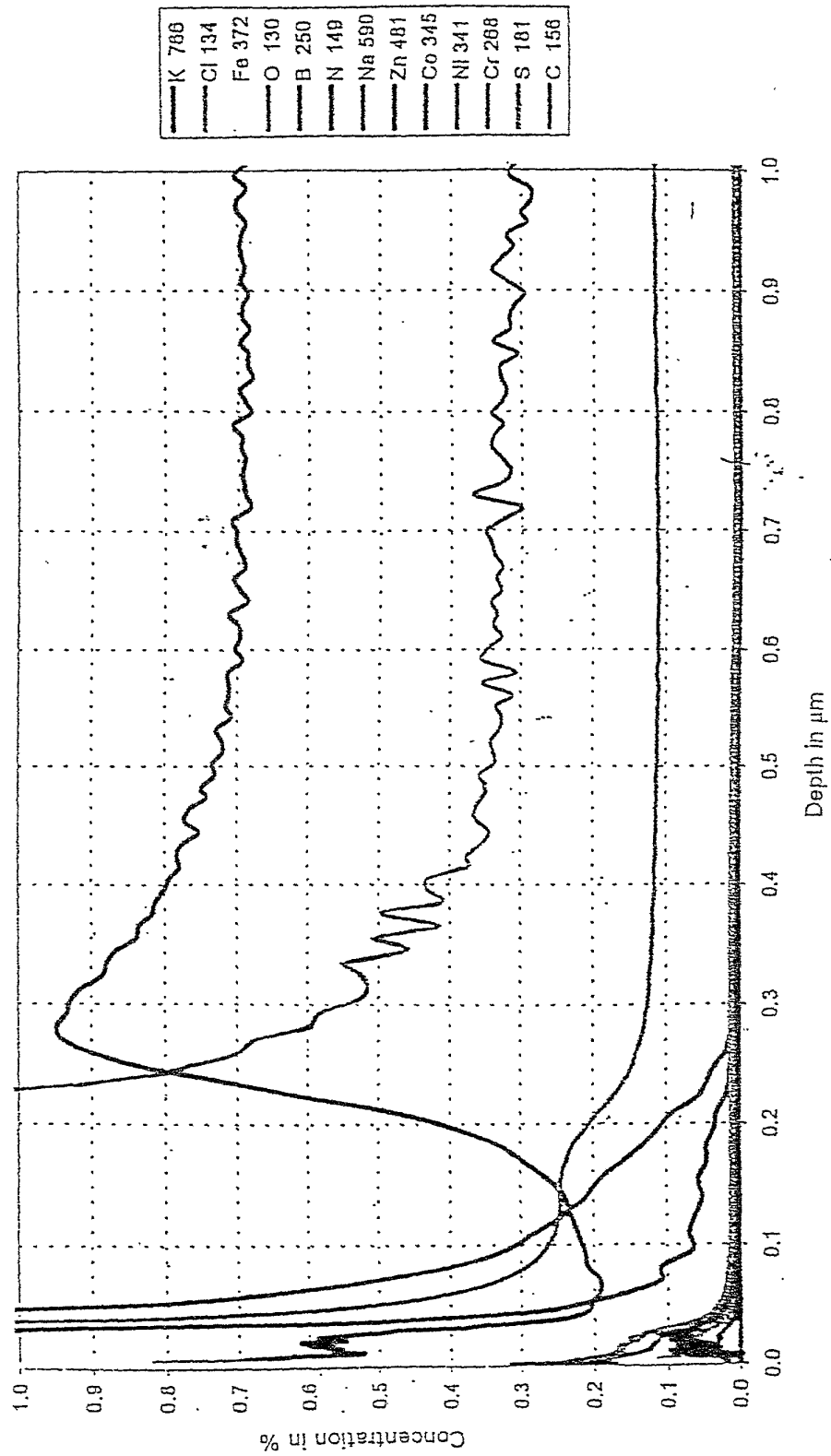
Fig. 25

Diagram 1

Sample 6, Measurement Position D



Sample 6, Measurement Position D



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 401
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

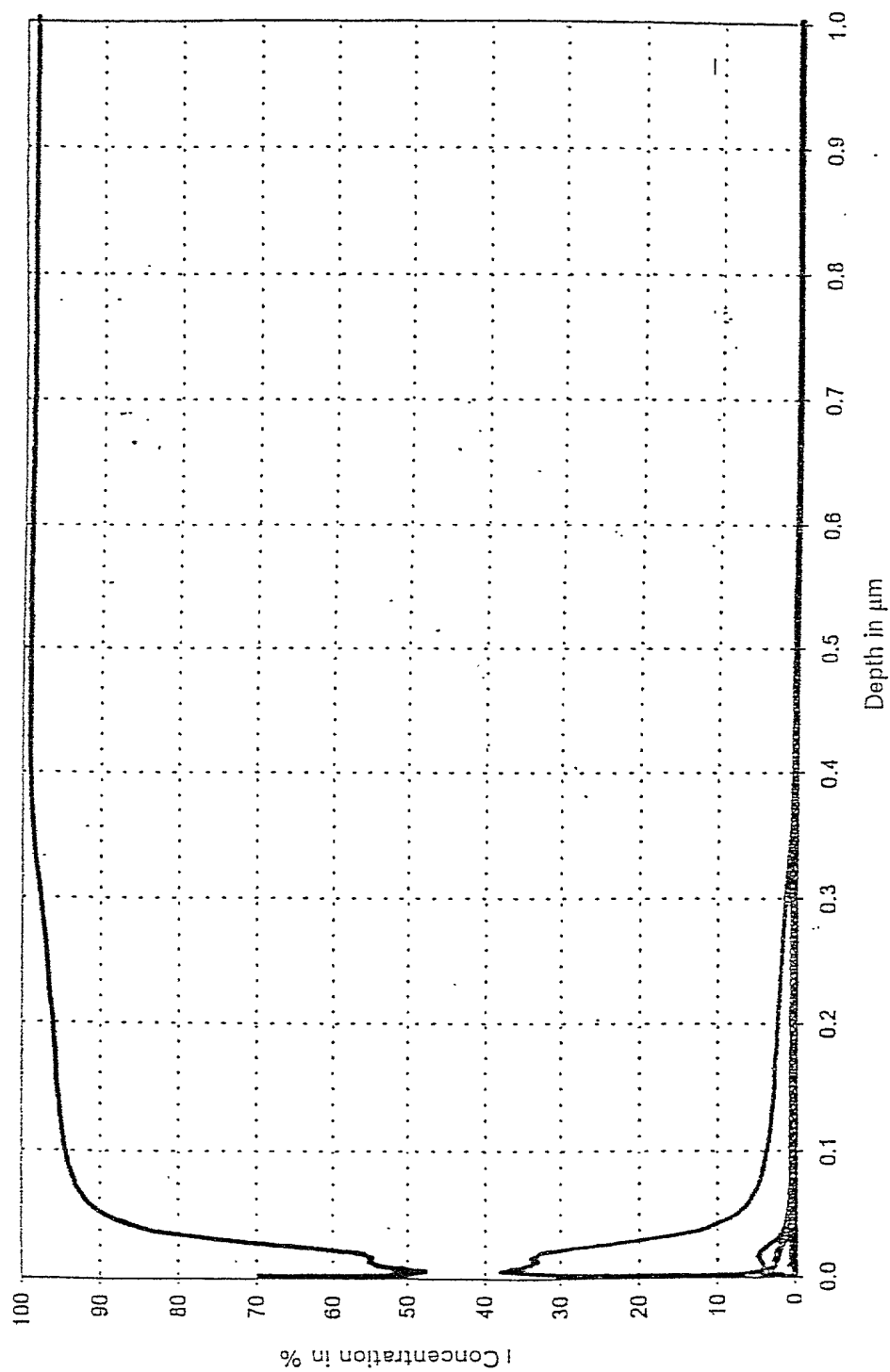


FIG. 27

Diagram 1

Sample 7, Measurement Position A

TOP OF SAMPLE

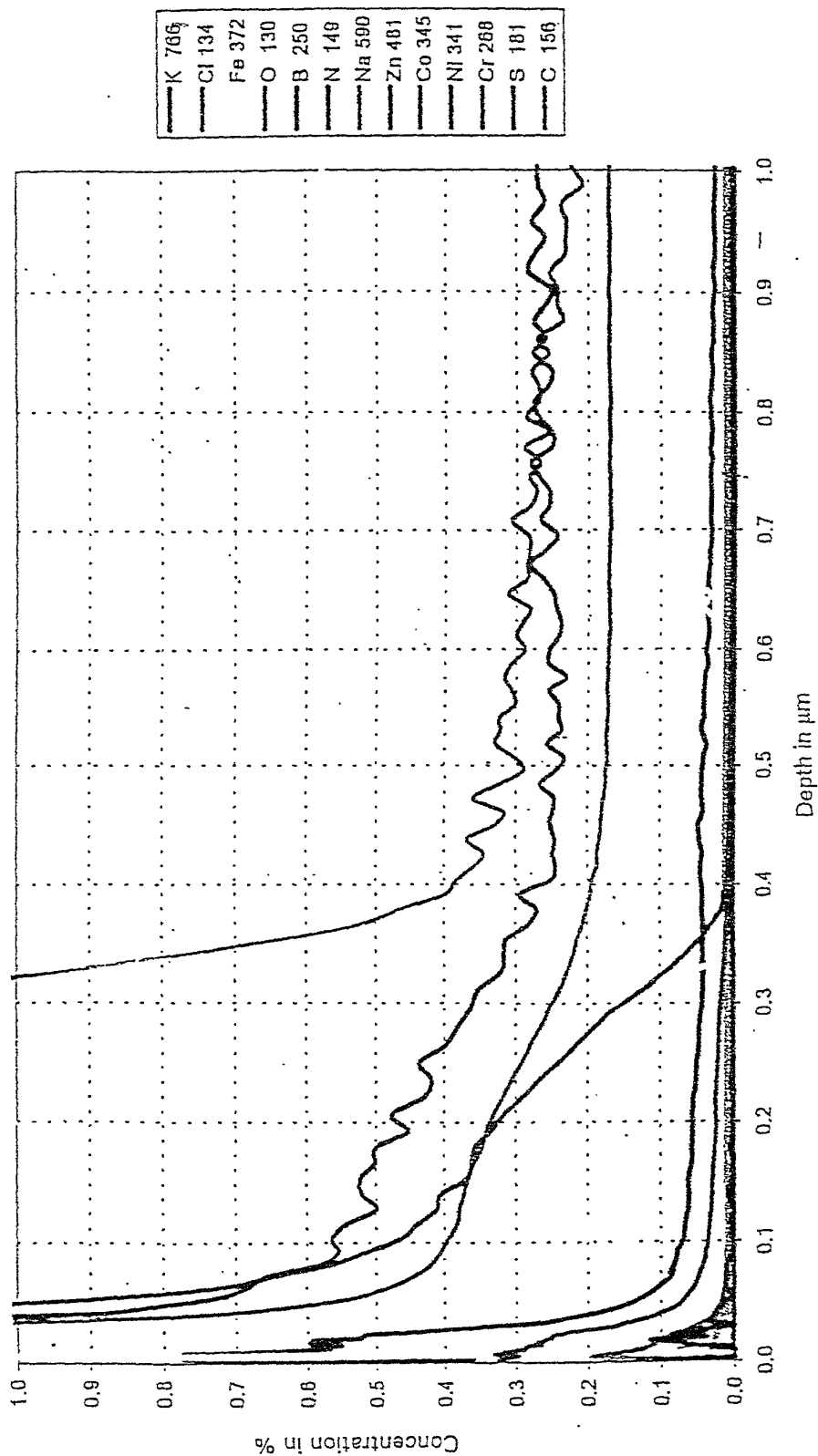
FOOTER: 660660

28/38

Diagram 2

Sample 7, Measurement Position A

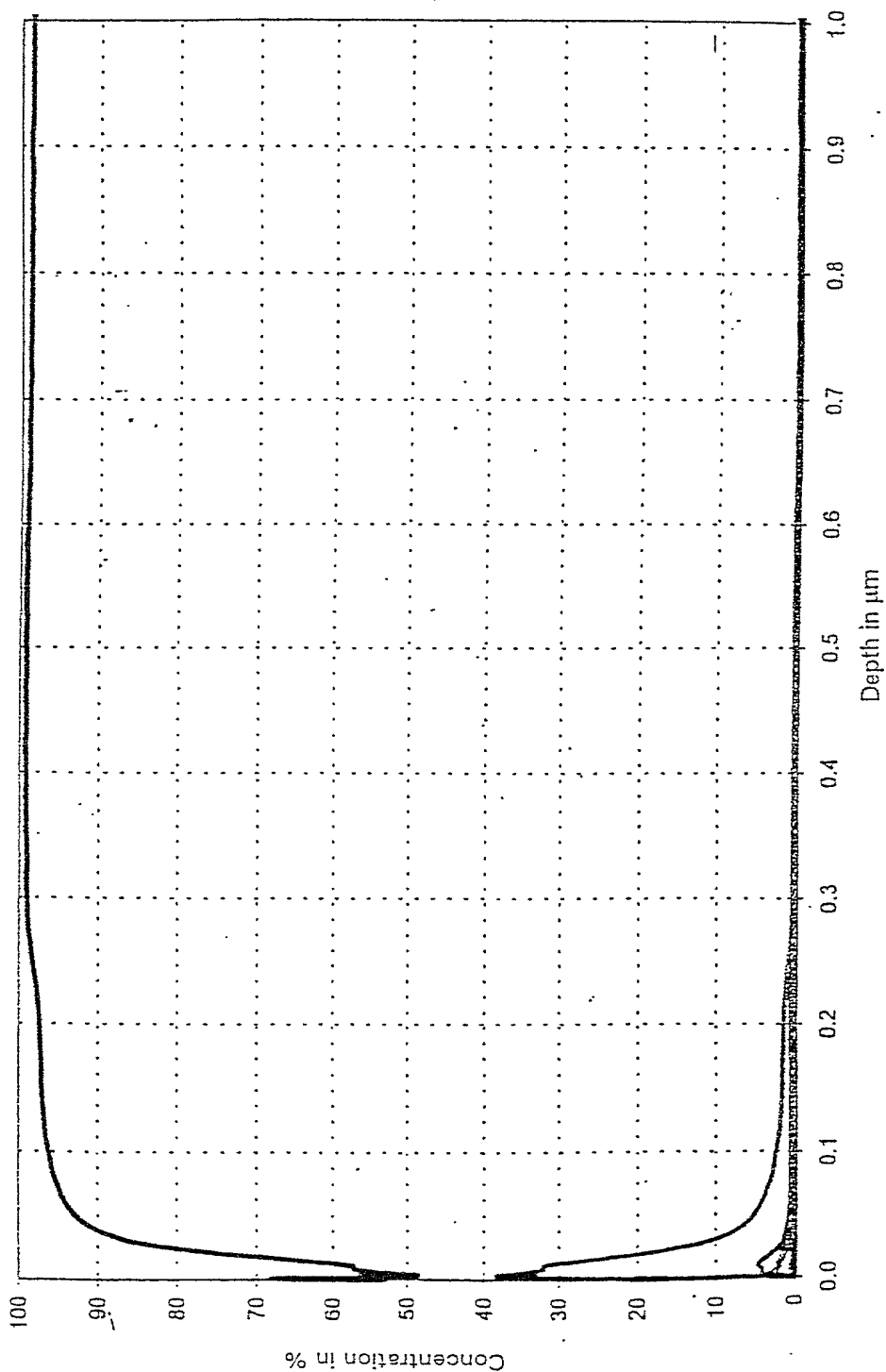
FIG. 28



—	K 786
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

Diagram 1

Sample 7, Measurement Position B



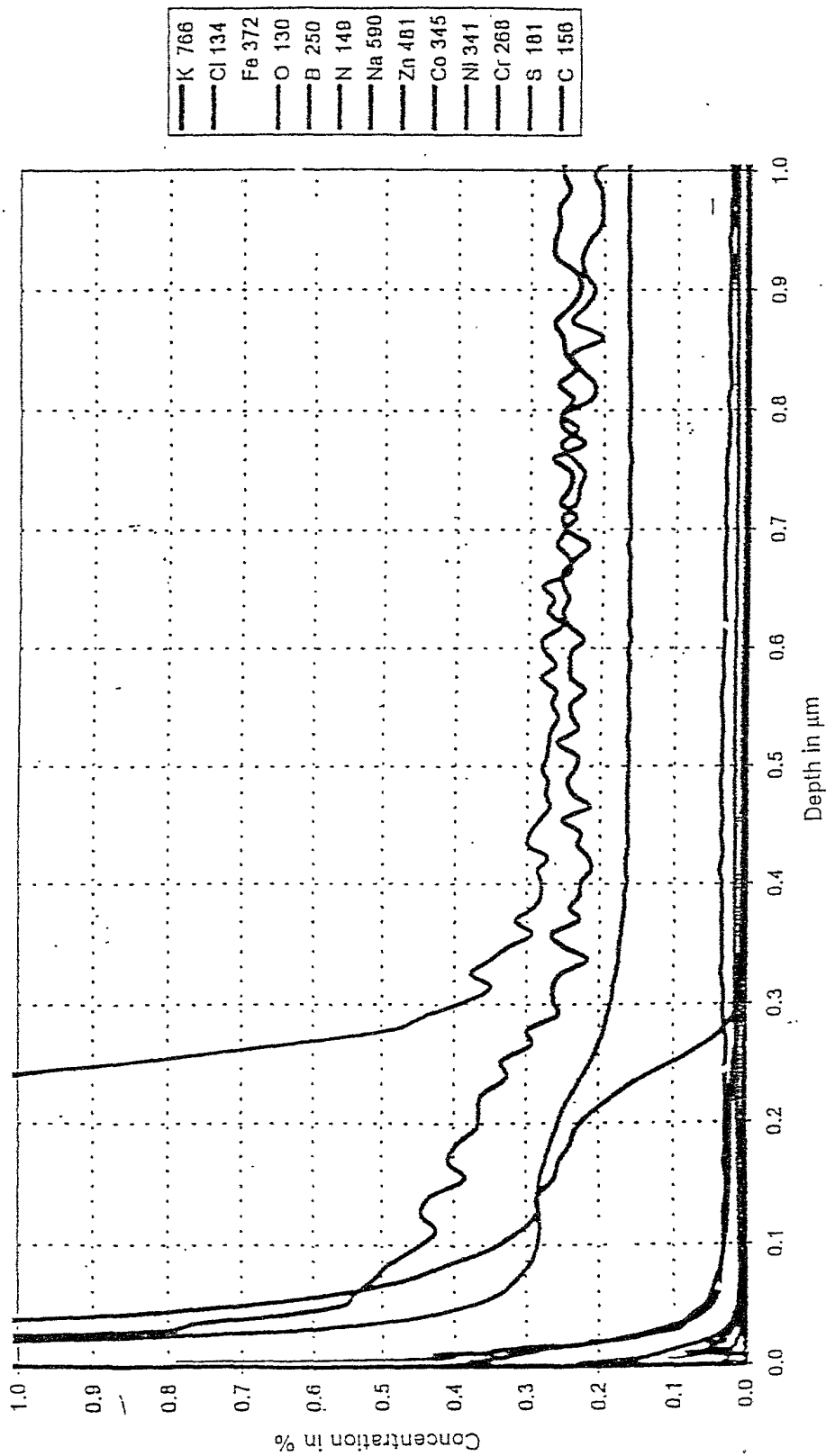
FOOT " 664060

30/38

Diagram 2

Sample 7, Measurement Position B

FIG. 30



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

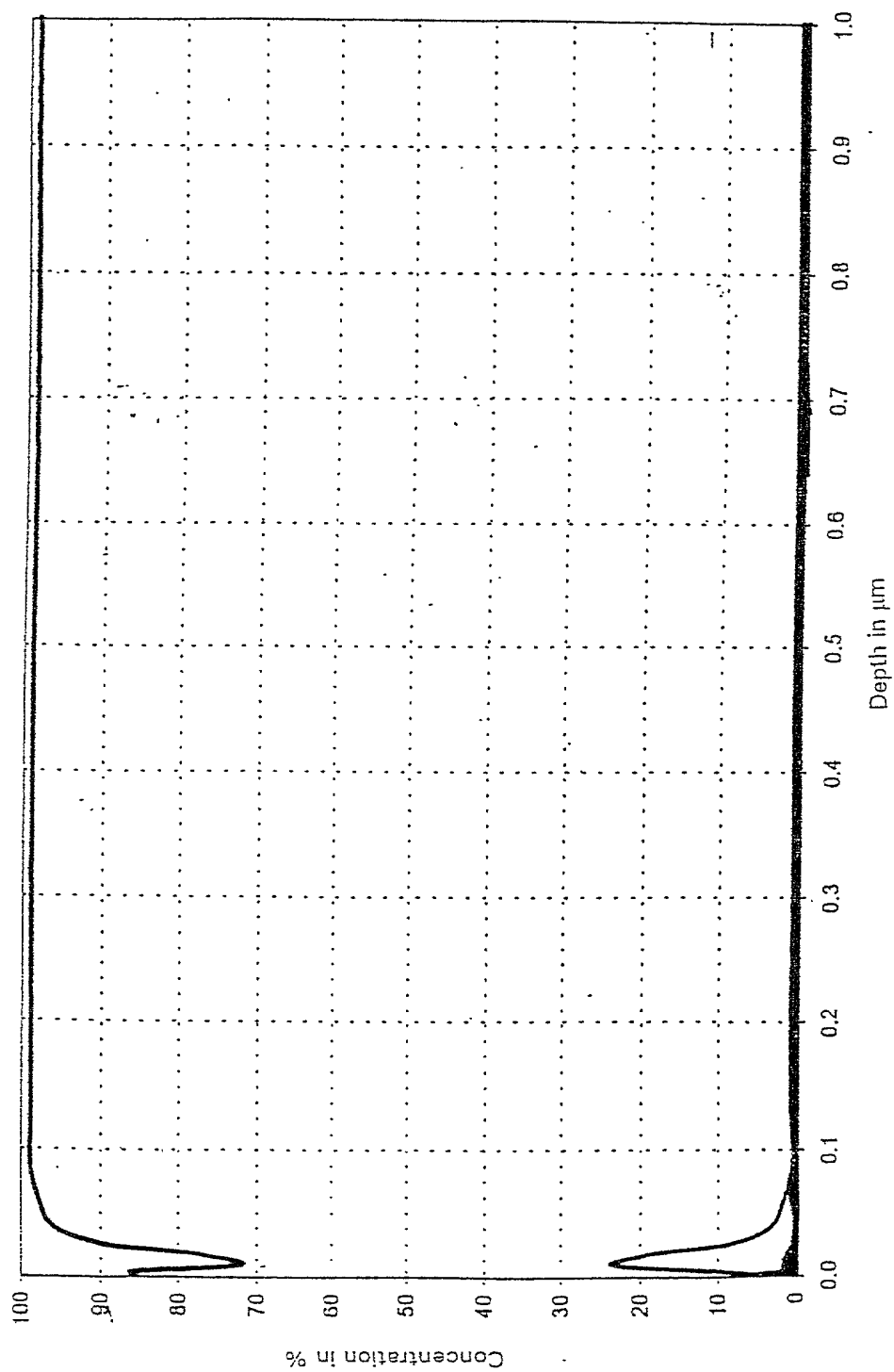


FIG. 31

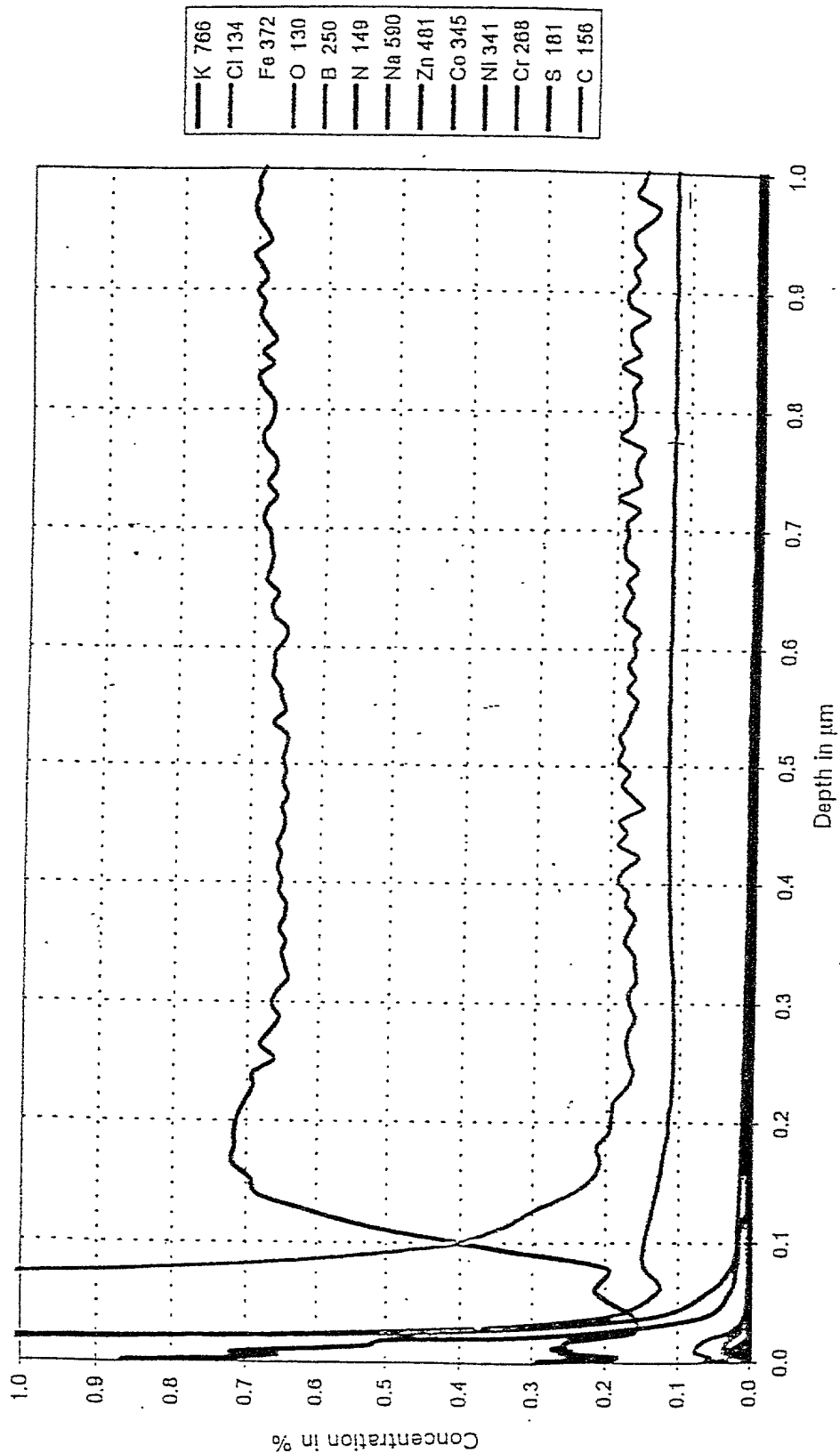
Diagram 1

Sample 8, Measurement Position A

Diagram 2

Sample 8, Measurement Position A

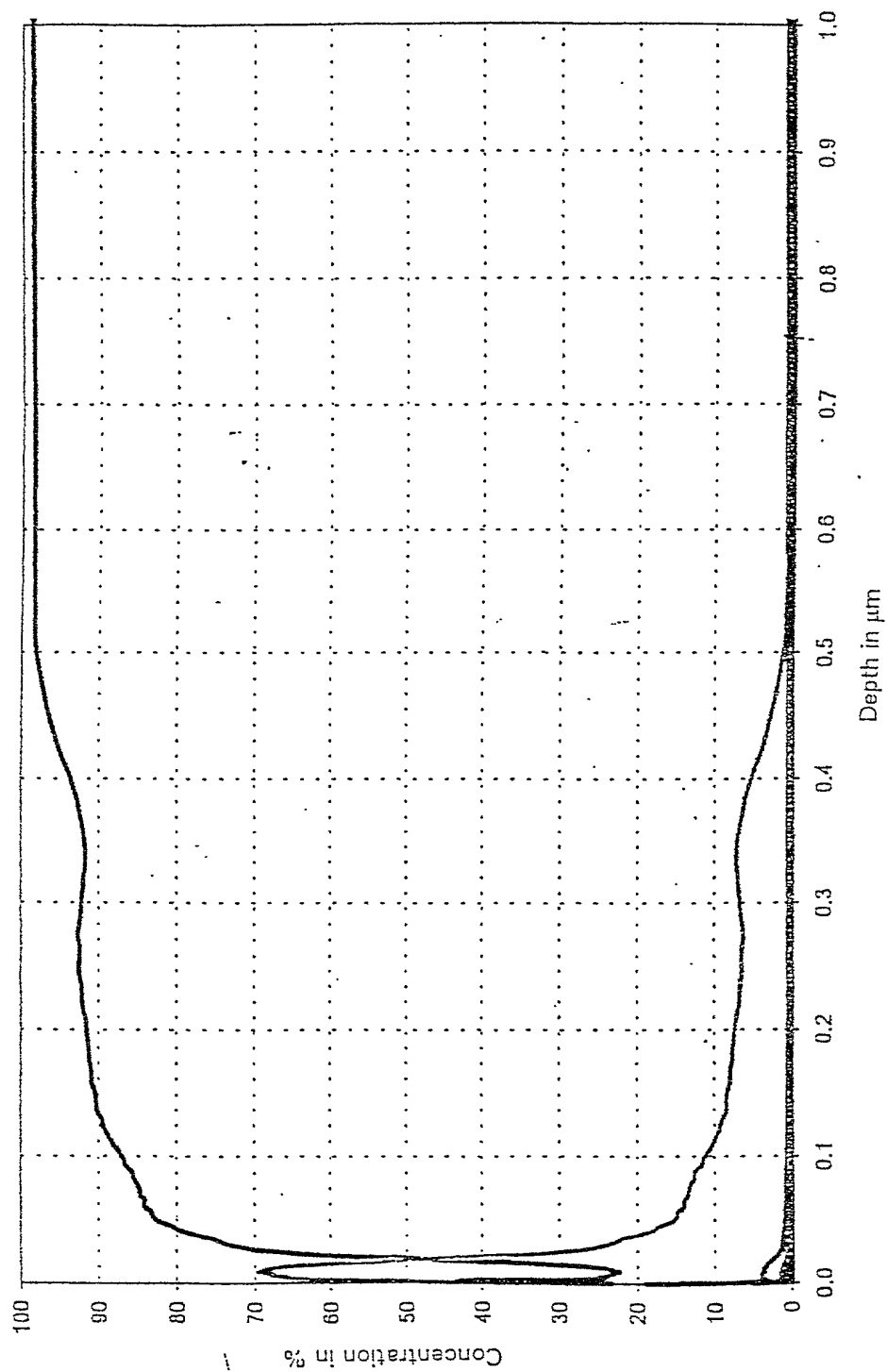
FIG. 32



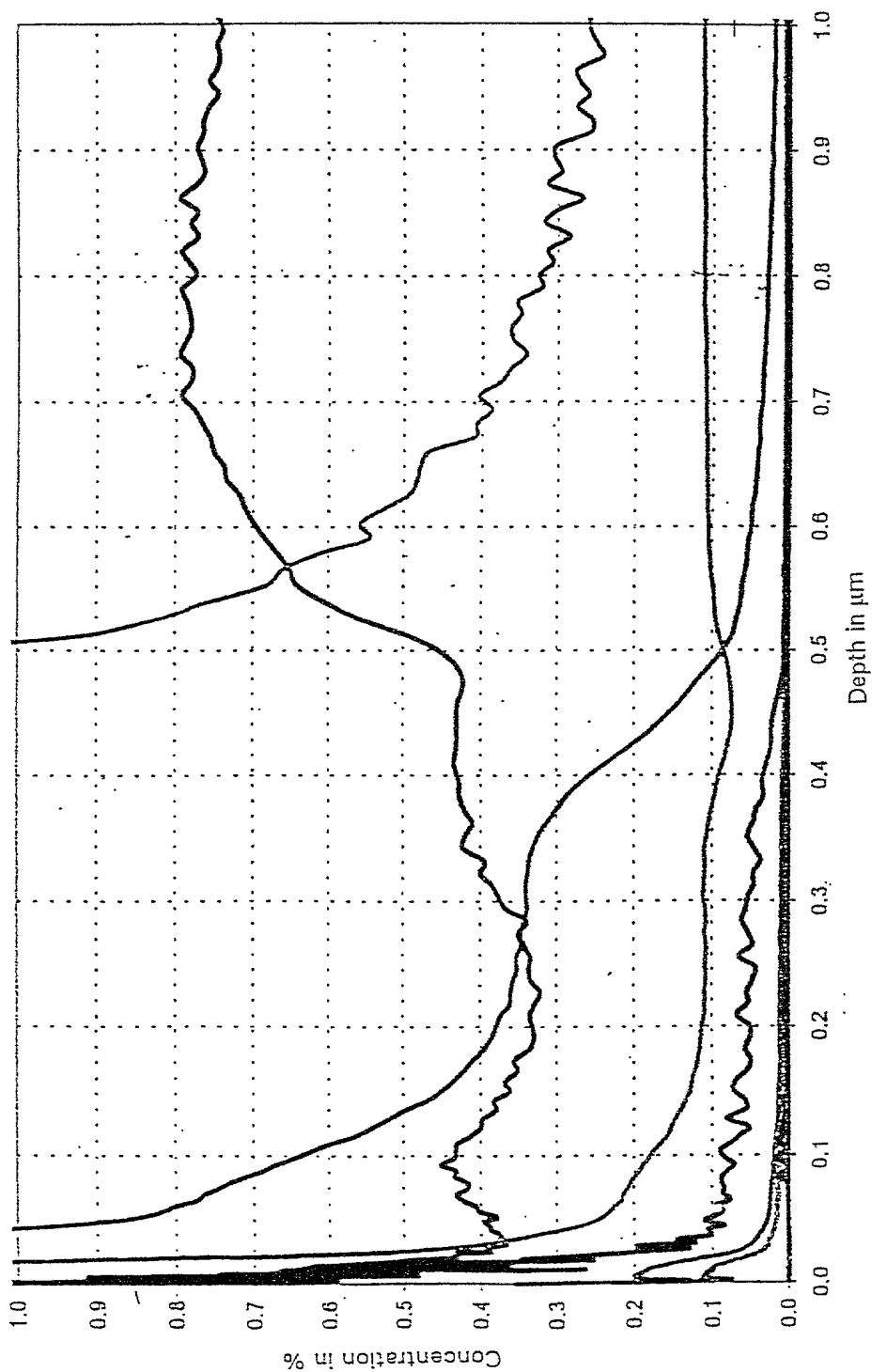
—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

Diagram 1

Sample 9, Measurement Position A



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156



Sample 9, Measurement Position A

Diagram 2

FIG. 34

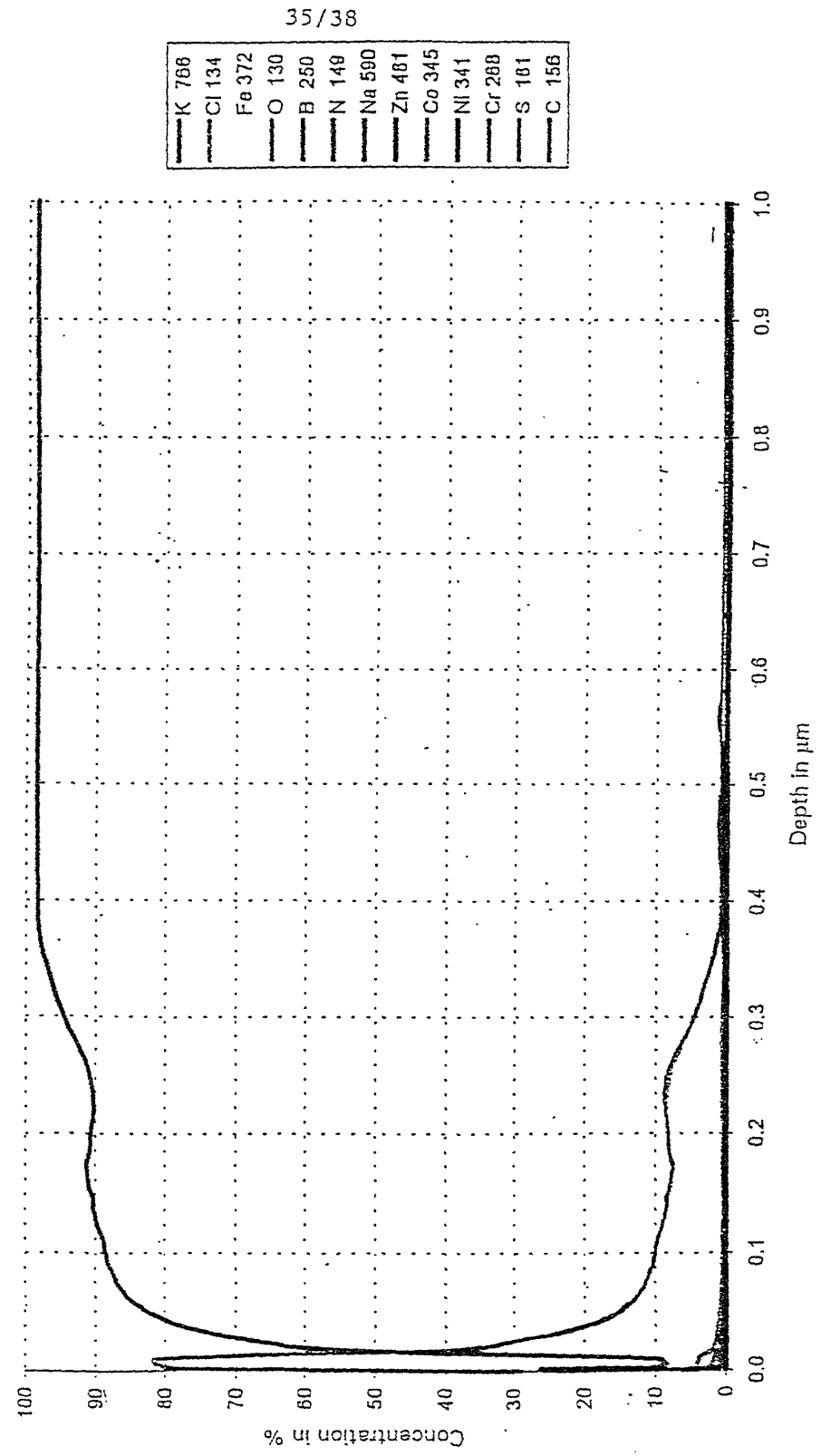
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Diagram 1

FIG. 35

Sample 9, Measurement Position B



—	K 766
—	Cl 134
—	Fe 372
—	O 130
—	B 250
—	N 149
—	Na 590
—	Zn 481
—	Co 345
—	Ni 341
—	Cr 268
—	S 181
—	C 156

Diagram 2

Sample 9, Measurement Position B

FIG. 36

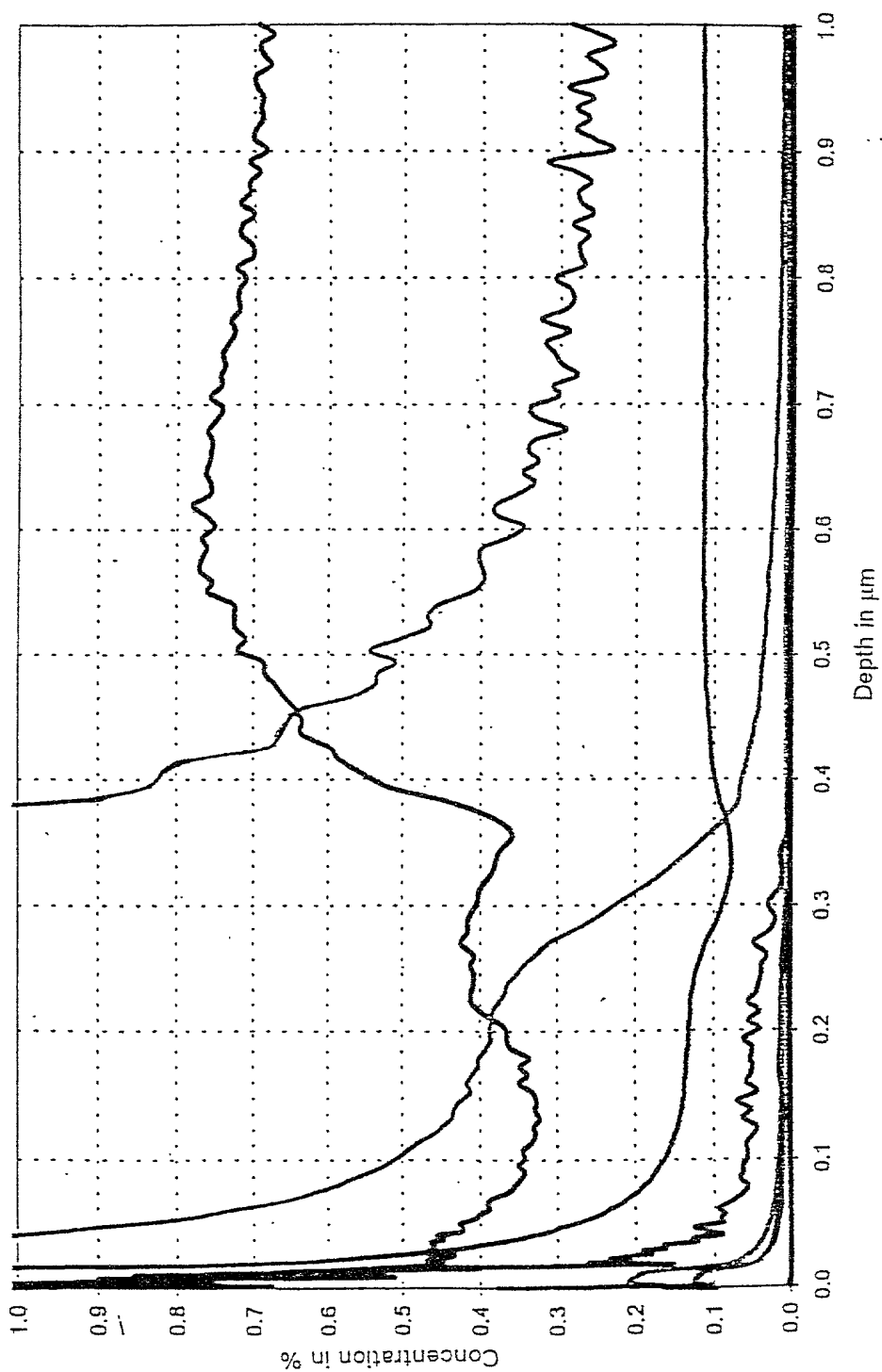
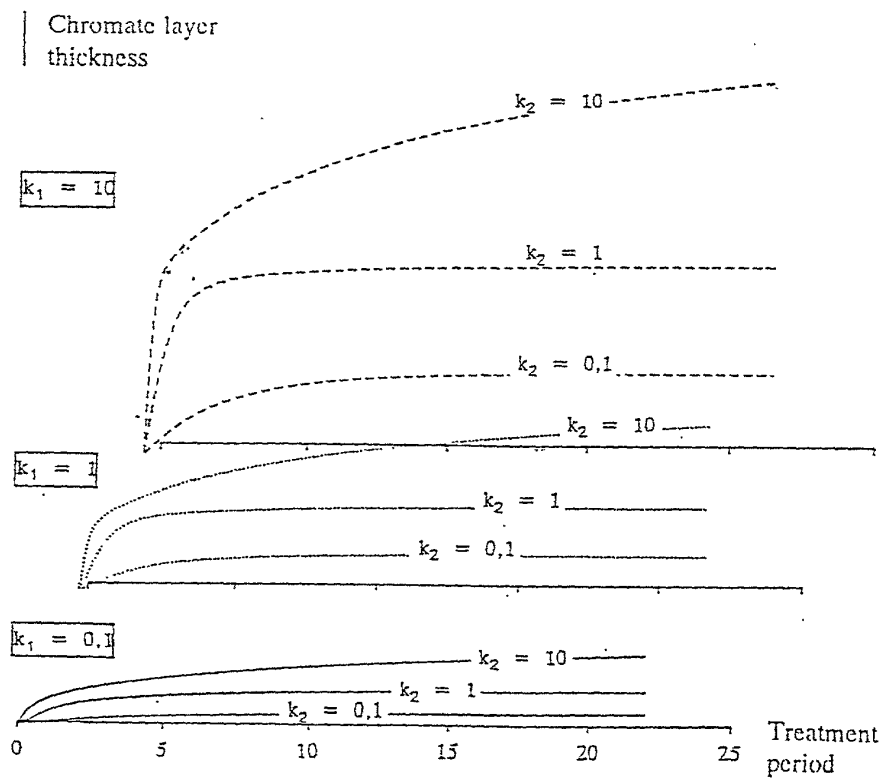


FIG. 37

	Methods				Sample No.			
	Ellipsometry nm	SEM nm	Glow-discharge nm (Cr > 1%) with Cr (%)	spectrometer chromium index nm (Cr > Zn)				
1. Prior Art								
Yellow chromation Cr(III) + Cr(VI)	-	300	440	11	48	17	25	9
Blue chromation Cr(III)	98	60	60	8	5	0	0	8
2. Invention (Chromitization)								
60°C Cr(III)	432	300	344	7	23	2	15	1,2,3,4,5
100°C Cr(III)	595	-	358	10	38	22	28	6
60°C on Zn/Fe Cr(III)	-	-	282	6	16	0	16	7
100°C, two-fold concentration Cr(III)	953	-	-	-	-	-	-	-

Fig. 38

38/38



Computer simulation of the kinetic model of
chromate coating of zinc for various rate constants